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A methodology for evaluating execution of universal joint tasks within the context of a computer-aided exercise

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THESIS

A METHODOLOGY FOR EVALUATING EXECUTION OF UNIVERSAL JOINT TASKS WITHIN THE CONTEXT OF A COMPUTER-AIDED EXERCISE

by

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September 1995

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One of the primary training tools available to a Unified Commander in Chief (CINC) for training his staff on their joint mission essential tasks is a command post exercise supported by a computer simulation model, commonly referred to as a Computer Aided Exercise (CAX). Currently, little quantitative data are captured during the exercise allowing for quick post-exercise analysis of critical staff processes inherent in the CINC's exercise training objectives. The objective of this thesis is to develop an exercise analysis methodology for evaluating the execution of joint tasks during the conduct of a CAX. Specific objectives are: 1) Demonstrate a methodology for developing quantifiable measures of effectiveness (MOEs). These measures must reflect the hierarchical structure of tasks given in the Universal Joint Task List (UJTL) as applied to the three levels of war (vertical linkage), and functionality considerations between related enabling tasks (horizontal linkage). 2) Determine methods for implementing staff plans and capturing task performance data within the design of the simulation. This is intended to support the exercise analysis by capturing critical decisions, assumptions, and causal factors inherent within staff actions as they relate to plan execution, and will provide a framework within which conclusions about observed outcomes can be based. This objective involves demonstrating the methodology in an exercise conducted utilizing the Joint Theater Level Simulation (JTLS). The effort in this thesis is focused exclusively on joint tasks involving sustainment and support, however, the principles of the methodology are applicable to the entire spectrum of tasks in the Universal Joint Task List (UJTL).

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A METHODOLOGY FOR EVALUATING EXECUTION OF UNIVERSAL JOINT TASKS WITHIN THE CONTEXT OF A COMPUTER-AIDED EXERCISE

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Submitted in partial fulfillment
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ABSTRACT

One of the primary training tools available to a Unified Commander in Chief (CINC) for training his staff on their joint mission essential tasks is a command post exercise supported by a computer simulation model, commonly referred to as a Computer Aided Exercise (CAX). Currently, little quantitative data are captured during the exercise allowing for quick post-exercise analysis of critical staff processes inherent in the CINC's exercise training objectives. The objective of this thesis is to develop an exercise analysis methodology for evaluating the execution of joint tasks during the conduct of a CAX. Specific objectives are: 1) Demonstrate a methodology for developing quantifiable measures of effectiveness (MOEs). These measures must reflect the hierarchical structure of tasks given in the Universal Joint Task List (UJTL) as applied to the three levels of war (vertical linkage), and functionality considerations between related enabling tasks (horizontal linkage). 2) Determine methods for implementing staff plans and capturing task performance data within the design of the simulation. This is intended to support the exercise analysis by capturing critical decisions, assumptions, and causal factors inherent within staff actions as they relate to plan execution, and will provide a framework within which conclusions about observed outcomes can be based. This objective involves demonstrating the methodology in an exercise conducted utilizing the Joint Theater Level Simulation (JTLS). The effort in this thesis is focused exclusively on joint tasks involving sustainment and support, however, the principles of the methodology are applicable to the entire spectrum of tasks in the Universal Joint Task List (UJTL).

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EXECUTIVE SUMMARY

One of the primary training tools available to a Unified Commander in Chief (CINC) for training his staff on their joint mission essential tasks is a command post exercise supported by a computer simulation model. This is commonly referred to as a Computer Aided Exercise (CAX). The primary role of the computer simulation is to present a decision environment within which the staff can be presented with realistic, stochastic results. Based on this simulated environment, staffs implement plans, monitor the current situation, and further develop or alter its plans as required. One weakness of the CAX lies in the inability to assess the level of training of those elements participating. Currently, little quantitative data are captured during the exercise that allows for quick post-exercise analysis of critical staff processes inherent in the CINC's exercise training objectives. Assessment of process performance in relationship to ability to perform mission essential tasks is important for two reasons. First, it helps to determine whether training resources are being used wisely, and if the training program is achieving the desired results. Second, it helps to determine which mission essential tasks are in need of additional training.

The objective of this thesis is to develop an exercise analysis methodology for evaluating the execution of joint tasks during the conduct of a CAX. Specific objectives are: 1) Demonstrate a methodology for developing quantifiable measures of effectiveness (MOEs) designed to work in conjunction with data manipulated by a computer simulation. These measures must reflect the hierarchical structure of tasks given in the Universal Joint Task List (UJTL) as applied to the three levels of war (vertical linkage), and functionality considerations between related enabling tasks (horizontal linkage). 2) Determine methods for implementing staff plans and capturing task performance data within the design of the simulation. This is intended to support the exercise analysis by capturing critical decisions, assumptions, and causal factors inherent within staff actions as they relate to plan execution, and will provide a framework within which conclusions about observed outcomes can be based. This objective involves demonstrating the methodology in an exercise conducted utilizing the Joint Theater Level Simulation (JTLS). Effort in the thesis is focused exclusively on joint tasks involving sustainment and support, however, principles of the methodology are applicable to the entire spectrum of tasks in the UJTL.

Fundamental to the methodology for developing measures of effectiveness (MOEs) is the assumption that execution of any given task at a specified level of war is related to the execution of similar tasks at other levels of war. For instance, the strategic joint task "Provide Theater Sustainment" (ST 8) in the UJTL is related to the respective operational and tactical tasks "Provide Operational Support" (OP 6) and "Provide Combat Service Support" (TA 6) by virtue of their common *functionality.* Furthermore, the concept of a functional relationship establishes the idea of vertical and horizontal linkages existing among

tasks. Vertical linkage not only describes the relationship existing between similar tasks across respective levels of war, but also between joint, supporting, and enabling tasks within a given level of war. Horizontal linkage, on the other hand, pertains to the dependent relationship existing between tasks describing one particular function or component with those describing another. For example, how well forces are sustained is dependent upon how well the functions of arming, fueling, maintaining, manning, etc. are executed. Similarly, the functional area pertaining to the manning of forces is dependent upon the components of field services, health services, reconstitution, training, and reception. Staff activities, as described by various tasks, become compartmentalized across components and functions as the size of the staff increases. In analysis, it is necessary to reflect the dynamics of vertical and horizontal linkage as a matter of aggregation and in the interest of maintaining the appropriate level of abstraction.

The methodology developed for implementing staff plans and processing data requirements entails representing essential elements of the plan within the simulation in a manner that is conducive both to orders input and the subsequent output of required MOE parameters. Within the logistics context, the plan is represented in terms of forecasted requirements at both the tactical and operational levels considering both current and future-phase operations. Data processing focuses on capturing reported on-hand amounts from a continuous-time perspective. Demonstration of results illustrate how an analysis comparing forecasted requirements to actual usage might help establish causal factors regarding observed significant events in the exercise.

The methodology is not intended to assess execution of joint tasks. Its focus is on evaluating *process* performance that ultimately is used to provide insight into significant events observed during the exercise. Implementation of the methodology places no burden on the staff during the course of the exercise, and actually helps to reduce model-driven workload in "gamer" cells by automating orders input. Additionally, the methodology provides an efficient means for embedding the staff's plan in the simulation. It is relatively uncomplicated, and thus conducive to the production of quick and insightful analysis.

I. INTRODUCTION

A. BACKGROUND

The Chairman Joint Chiefs of Staff (CJCS) Memorandum of Policy 26 (MOP 26) establishes a program for carrying out the joint training responsibilities of the CJCS, the Unified Commanders in Chief (CINCs), and the CINCs' component staffs. MOP 26 institutes a method for identifying training requirements through the review of the CINC's mission and the compilation of Joint Mission Essential Task List (JMETL). A CINC's JMETL is intended to provide the basis for all joint training.

The Universal Joint Task List (MCM 147-93), a supplement to the Joint Training Manual (MCM 71-92), is a comprehensive listing of all joint tasks pertaining to the Armed Forces of the United States. It is intended to provide a common language for describing joint warfighting capabilities throughout the entire range of military operations to include operations other than war. Specifically, tasks are defined as they relate to the strategic (both national and theater), operational, and tactical levels of war. Each joint task is broken down into *supporting* tasks which may in turn be further refined into *enabling* tasks.

One of the primary training tools available to a CINC for training his staff on their joint mission essential tasks is a command post exercise supported by a computer simulation model. This is commonly referred to as a Computer Aided Exercise (CAX). The primary role of the computer simulation is to present a decision environment within which the staff can be presented with realistic, stochastic results. Based on this simulated environment, staffs implement plans, monitor the current situation, and further develop or alter its plan as required by changing requirements.

B. PROBLEM STATEMENT

The objective of this thesis is to develop an exercise analysis methodology for evaluating the execution of joint tasks during the conduct of a CAX. Specific objectives are: 1) Demonstrate a methodology for developing quantifiable measures of effectiveness (MOEs) designed to work in conjunction with data manipulated by a computer simulation. These measures must reflect the hierarchical structure of tasks as applied to the three levels of war (vertical linkage), and functionality considerations between related enabling tasks (horizontal linkage). 2) Determine methods for implementing staff plans and capturing task performance data within the design of the simulation. This is intended to support the exercise analysis by capturing critical decisions, assumptions, and causal factors inherent within staff actions as they relate to plan execution, and will provide a framework within which conclusions about observed outcomes can be based. This objective involves demonstrating the methodology in an exercise conducted utilizing the Joint Theater Level Simulation (JTLS). Implicit tasks include aligning plan requirements with the model's database, developing algorithms required in post processing, and specifying output file format.

This research parallels a similar effort by LT Chris Towery, USN, on Universal Joint Tasks involving intelligence. [Ref. 1] It is recommended that his thesis be read in conjunction with this document. Both methodologies were applied to the same JTLS exersise, and together exemplify the multi-aspect approach to exercise analysis.

C. THESIS STRUCTURE

The next chapter of this thesis outlines the joint training system used within the Department of Defense (DOD). Chapter III details a methodology for developing quantifiable measures of effectiveness. The methodology focuses on describing relationships existing among tasks in terms of the critical issues underlying their accomplishment. Chapter IV demonstrates a methodology for embedding staff plans and estimates in the Joint Theater Level Simulation, and extracting data which can be used in a post exercise analysis. Chapter V discusses conclusions and provides recommendations for further refinements and study.

II. JOINT TRAINING PROCESS

> Maintaining high readiness of our forces is a prerequisite to deterring aggression and responding to crises. Today we are placing increased emphasis on joint readiness strengthening joint doctrine and education, developing joint readiness measures, and improving joint and coalition training. [Ref. 2: p. iii]

As a world leader, the United States requires a strong and ready military. Naturally, this pursuit often conflicts with domestic needs, thereby placing a premium on the efficient implementation of strategy without a compromise in effectiveness. Critical to ensuring effectiveness is recognition that the military is a "hands-on profession." Leaders at all levels do most of their learning during training, thus making "realistic, demanding, and objectively measured training and exercises a must" [Ref. 3].

A. DEVELOPMENT OF THE UNIVERSAL JOINT TASK LIST (UJTL)

The latest version of the Universal Joint Task List is being developed by Dynamics Research Corporation (DRC) under the direction of the Joint Exercise and Training Division (JETD) of the J-7 Directorate, the Joint Staff. The project is a two year effort leveraging Army lessons learned on similar activities. Over 120 organizations have provided design inputs, all of which have been coordinated through the Joint Staff, CINCs, Services, and other concerned agencies. [Ref. 4] The UJTL provides a common language for describing joint warfighting capabilities in terms of tasks, conditions, and standards. Furthermore, capabilities within it describe the entire range of military operations, to include operations other than war. [Ref. 5]

The overall project involves creation of the joint task list, joint conditions list, and associated task measures. The joint task list consists of all joint, supporting, and enabling tasks at each of the three levels of war which formally specify the required capabilities of the nation's armed forces. The joint conditions list contains various physical, political, social, and military states that describe operational environments. Measures (of effectiveness) are parameters describing task performance that, when specified in terms of conditions and a minimum acceptable level of performance, are a statement of the task's standard. The joint measures list provides performance criteria at the task level to assist commanders in assessing staff performance and determining those tasks in greatest need of additional training. [Ref. 5]

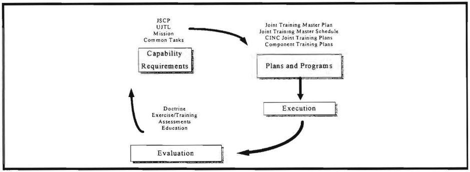


Figure 1. Joint Training Strategy

B. JOINT TRAINING PROGRAM

> Ships, planes, tanks, and most importantly, trained soldiers, sailors, airmen, and marines, and the leadership to make the force work in joint and combined operations cannot be created in a few days or months. *General Colin L. Powell* [Ref. 3]

The joint training program encompasses all aspects of joint training within the Department of Defense. Fundamental to the program are the following two tenets: 1) Base training on mission requirements with warfighting as the highest training priority, and 2) Joint training must conform to joint doctrine. [Ref. 4] Figure 1 illustrates the military's joint training strategy. Required national capabilities are specified in the Joint Strategic Capabilities Plan (JSCP) as determined through analysis of international obligations and Operations Plans (OPLANS). Military missions supporting the national military strategy are assigned to CINCs, after which a mission analysis is conducted to determine command-level capabilities required. [Ref. 6,7] Essential capabilities are reflected in the CINC's Joint Mission Essential Task List which identifies his priorities and provides the collective requirements base for all joint training. Joint Mission Essential Tasks must be referenced in terms of the UJTL. [Ref. 5] Requirements for training are based on the CINC's JMETL, along with applicable joint doctrine/ joint tactics, techniques, and procedures (JTTP). They are analyzed in terms of appropriate mission conditions, necessary standards, command level responsibility, and training resources available in order to generate the CINC's Joint Training Plan and subsequent exercise schedule. [Ref. 5]

The purpose of the joint training program is to better link the joint training system and the joint doctrine system to provide an improved fighting force for the CINC. The focus is on clearly defining joint training requirements in order to use scarce resources more effectively, and to provide better ways and means of conducting joint training in the interest of improving readiness. [Ref. 5]

III. MOE DEVELOPMENT

This chapter presents a methodology for developing quantifiable measures of effectiveness for assessing logistics functions described in terms of the appropriate Universal Joint Tasks. Fundamental to the methodology is the assumption that execution of any given task at a specified level of war is related to the execution of similar tasks at other levels of war. For instance, the UJTL strategic joint task "Provide Theater Sustainment" (ST 8) is related to the respective operational and tactical tasks "Provide Operational Support" (OP 6) and "Provide Combat Service Support" (TA 6) by virtue of their common *functionality.* Furthermore, the concept of a functional relationship establishes the idea of vertical and horizontal linkages existing among tasks. Vertical linkage not only describes the relationship existing between similar tasks across respective levels of war, but also between joint, supporting, and enabling tasks within a given level of war. Horizontal linkage, on the other hand, pertains to the dependent relationship existing between tasks describing one particular function or component with those describing another. For example, how well forces are sustained is dependent upon how well the functions of arming, fueling, maintaining, manning, etc. are executed. Similarly, the functional area pertaining to the manning of forces is dependent upon the components field services, health services, reconstitution, training, and reception. Staff activities, as described by various tasks, become compartmentalized across components and functions as the size of the staff increases. In analysis, it is necessary to reflect the dynamics of vertical and horizontal linkage as a matter of aggregation and in the interest of maintaining the appropriate level of abstraction.

Specific steps of the methodology include structuring the schematic of related joint tasks, developing functional templates, relating issues to performance data requirements (dendritic), and determining measures of performance and effectiveness.

A. JOINT TASKS SCHEMATIC

Within the UJTL, tasks are broken down in accordance with the three levels of war. The first step in the methodology is the development of a joint task schematic that reflects the vertical and horizontal linkages discussed above. The schematic depicts the relationship between tasks among the three levels of war. Hierarchical relationships regarding respective levels of war are illustrated by the relative vertical position at each task level and are distinguished by line color. Relationships between joint, supporting, enabling, and refined enabling tasks are further distinguished by task number. One digit numbers

correspond to joint tasks. Two, three, and four digit numbers correspond to supporting, enabling, and refined enabling tasks, respectively. Fill colors illustrate various functional areas, and thus represent one aspect of horizontal linkage. The schematic for tasks relating to sustainment and support is shown in Figure 2.

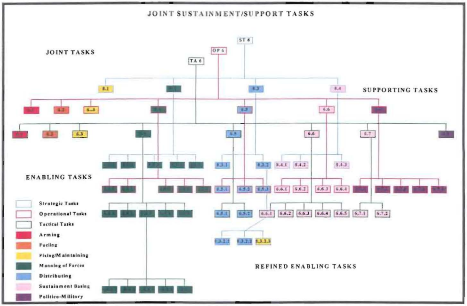


Figure 2. Tasks Schematic

B. FUNCTIONAL TEMPLATES

Functional templates illustrate the *precise* relationship among tasks within a functional area. Emphasis is on depicting the task-to-task linkage *between* the levels of war. In addition, components comprising the given functional area are emphasized. The template is constructed by first considering the basic task layout for a functional area as represented in the task schematic. This highlights the hierarchical relationship existing between tasks within a given level of war. Next, relationships between related enabling tasks across levels of war are determined. This is done by analyzing the scope of each task as it is defined in the UJTL. Formulation of the functional template supports the methodology by providing a complete overview of the span of sub issues (similar components) and the levels at which they are resolved (aggregation) for each functional area. The functional template for Manning of Forces is shown in Figure 3. Templates for the remaining six functional areas are given in Appendix A.

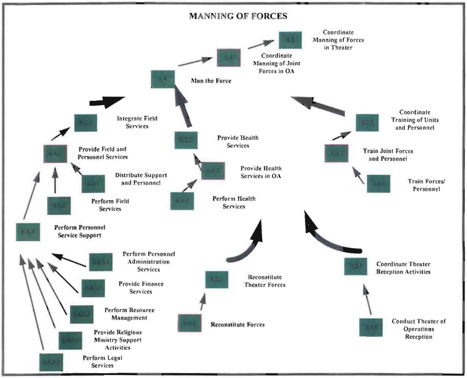


Figure 3. Functional Template

C. DENDRITIC

The purpose of the dendritic is to refine task requirements to the point where data explicative of performance can be gathered. The dendritic is formed by focusing on the overall intent of related joint tasks across levels of war and reformulating it in the form of a question. This question represents the overall issue to be resolved. Likewise, corresponding functional areas form critical subordinate issues that generally reflect the level at which measures of effectiveness (MOEs) are developed. Specific task requirements within each of the functional areas serve to formulate yet another level of sub issues that may determine underlying measures of performance (MOPs). Continued refinement of task requirements ultimately leads to the point where data can be gathered.

Data requirements are assumed to be unconstrained by physical mechanisms (data base size, processing times, model resolution, etc.). Furthermore, they may be objective or subjective. Objective data

refer to those directly measurable or capturable within the context of the computer simulation. Subjective data include non-measurable or non-quantifiable factors that may stand alone, or serve to help qualify observed results. A complete dendritic addressing the issue of tactical forces having the munitions they require is illustrated in Figure 4.

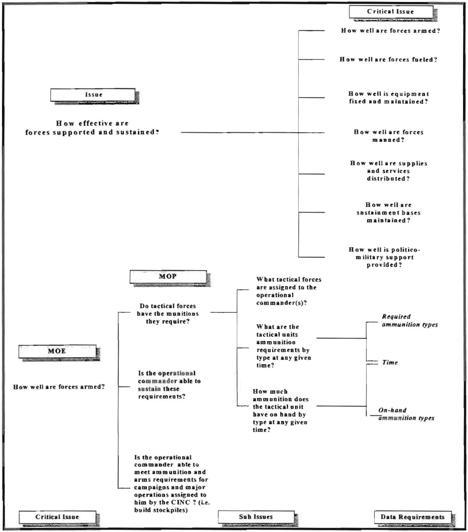


Figure 4. Dendritic

D. MOP AND MOE DEVELOPMENT

Each issue in the dendritic can be classified as supporting the development of measures of effectiveness, measures of performance, or data collection. Issues driving the collection of data are assessed as to their direct output (level 1 data) and post-processing (level 2 data) requirements. MOPs and MOEs represent an aggregation of supporting data at levels of issues where meaningful conclusions can be made. They are derived by rolling collected results backwards through the dendritic to the point where they can be combined to address specific issues. A discussion of potential measures developed through application of the methodology for arming, fueling, and fixing/maintaining equipment follow. Definitions of the terms used in the discussion are given in Table 1.

Term	Definition
TAC	*tactical level*
OP	*operational level*
OH	*on-hand amount*
REQ	*requirement*
TACREQ	*sum of requirements for all tactical (subordinate) forces in an operational area*
TACOH	*sum of amount on-hand for all tactical (subordinate) forces in an operational area*
OPREQ	*total operational requirement*
STOCKOH	*amount on-hand in operational stockpiles*
CAP	*generic capacity*
MOBCAP	*mobile capacity*
STATCAP	*static capacity*
util	*utilized*
avail	*available*
notutuil	*not utilized*
i	*resource type (i.e. stinger missile, JP-4, F-15E, etc.)*
j	*tactical unit (more generally, command subordinate to operational commander)*
k	*theater of operation*
t	*time*
t'	*future time*

Table 1. MOP Term Definitions

1. Arming Forces

Potential measures of performance for the three sub issues addressing arming of forces are described below.

1. For a given type of ammunition, i, what percent of the tactical force's, j, requirements are on-hand at time, t?

$$\frac{OH_{i,j,k}(t)}{REQ_{i,j,k}(t)}$$

2. For a given type of ammunition, i, what percent of the summed shortages for all tactical or subordinate forces, j, are available in operational stockages at time, t?

$$\frac{STOCKOH_{i,k}(t)}{TACREQ_{i,k}(t) - TACOH_{i,k}(t)}$$

3. For a given type of ammunition, i, what percent of the operational commander's future requirement at time, t', is currently on-hand at time, t ?

$$\frac{STOCKOH_{i,k}(t) - TACREQ_{i,k}(t)}{OPREQ_{i,k}(t')}$$

2. Fueling The Forces

Issues concerning the fueling of forces in a theater of operation are similar to those of arming. Generally speaking , these address how well tactical requirements are met, how well the operational commander can sustain routine tactical requirements, and how well the operational commander is doing in establishing required reserves (or capabilities) for future campaigns and major operations. Unlike most dry supplies which are relatively easy to store and stockpile, fuel stockage is constrained by existing storage and flow capacities. A robust view of storage capacity (or capability) would distinguish that which is mobile (fleet oilers, aerial tankers, fuel trucks, etc.) from that which is not (fuel farms, fuel bladders, etc.). Accordingly, applicable MOPs and MOEs might consider how well these various capacities are utilized. Again, in the interest of robustness, both types of capacity can be distinguished by that which is nominally present within the theater of operations or provided in the unit's table of organization and equipment, that which is available after battle or maintenance losses are considered, and lastly, that which is actually utilized and reflects command policies or decisions. For example, a certain unit possesses a 100,000 gallon diesel-fuel carrying capability in accordance with its modified table of organization and equipment (MTOE) of which 5,000 gallons has been lost to battle damage, and an additional 5,000 gallons is unavailable for maintenance reasons. Furthermore, intense guerrilla activity along the main supply route (MSR) have halted resupply efforts over the last twelve hours leaving the unit with 60,000 gallons presently on-hand. In this scenario 90 percent of the unit's nominal capacity is available of which only 67 percent is currently utilized. The utility of such an approach is evident when auditing a particular outcome in search of causal factors. An example of how such factors might be incorporated in a measure of performance is provided below.

For a given type of fuel, i, what percent of the tactical force, j, requirements are on-hand at time, t?

$$\frac{OH_{i,j,k}(t)}{REQ_{i,j,k}(t)}$$

where,

$$OH_{i,j,k}(t) = MOBCAP_{i,j,k}^{util}(t) + STATCAP_{i,j,k}^{util}(t)$$

and,

$$CAP_{i,j,k}^{util}(t) = CAP_{i,j,k}^{avail}(t) - CAP_{i,j,k}^{notutil}$$

3. Fixing And Maintaining Equipment

Fundamental to developing measures of performance and resulting measures of effectiveness is the concept of repairing at the lowest level possible, and describing this ability in terms of the respective echelon's *restorative capability*. That is, to effect repairs, a given echelon (level) of maintenance must possess the required repair parts, necessary job skills, and special equipment to do the job. Furthermore, if the echelon does not possess one of these capabilities, or in certain instances is operating at capacity, it must evacuate the equipment to the next level of maintenance. Given that an organization possesses a fixed amount of restorative capability in terms of repair parts, job skills, and equipment requirements, the percent utilized at any given time provides insight into the maintenance and repair process.

Also essential to the overall measure of effectiveness regarding maintenance and repair in a particular organization is its operational readiness rate or conversely, percent of reportable equipment (capability) not available. Again, in the interest of establishing causal factors, distinctions should be made between battle losses and routine maintenance losses. A low operational readiness rate attributable to maintenance losses has vastly different implications than one attributable to battle losses. Complementing this particular MOP is the percent of capability returned to an operational status either through repair or replacement.

One of the greatest challenges in developing MOPs addressing these issues is how to relate them across various branches of the services in order to maintain the necessary joint perspective required of the theater model, and to allow for across-service comparisons. For example, consider a theater of operations consisting of one heavy Army division with an Aegis cruiser providing ballistic missile defense. It is easy to conceptualize that damage sustained by an M1 tank might remove it, at least temporarily, from operations. However, damage sustained by the cruiser may not remove it immediately from theater.

Damage to the cruiser probably reduced or degraded its capability just as loss of the tank degraded the division's overall capability. Therefore, to allow for continuity across various services and organizations, one might conceptualize all tactical forces as being describable and hence related in terms of four functional capabilities. These are: *mobility, fire power,* $C^4 I$, and *sustainment.* Focusing on capabilities allows one to readily identify components of each as they are represented in a particular organization. For instance, M1 Tanks and Bradley Fighting Vehicles are two of the components describing the functional capability *firepower* in the heavy division while steering system and power plant are components representing the functional capability *mobility* in the Aegis cruiser.

E. SUMMARY

The role of a commander and his staff is to formulate issues that coincide with specific training objectives for an exercise. The role of the analyst is to develop measures and determine data requirements for the simulation to assist in causal analysis of significant events observed during the exercise. The methodology presented proposes developing MOEs by aligning task description with inherent issues and refining these to the point where specific data requirements, which are not necessarily quantitative, are established. The examples presented above demonstrate that, given adequate analysis of the issues essential to successful task accomplishment, development of required measures becomes relatively straight forward.

IV. JTLS APPLICATION

The focus of this chapter is the demonstration of a methodology for implementing staff plans and extracting MOE data requirements within the design of the Joint Theater Level Simulation. This implies reliance on information and procedures inherent in the model to represent plans and produce the required outputs. However, emphasis is placed on keeping the simulation as transparent as possible to the normal activities of the staff. The intent is to adapt the capabilities of JTLS to the needs of the staff, rather than adapting the staff to the requirements of JTLS. The methodology is designed to expedite the implementation of staff plans and orders, while still facilitating the capture and processing of necessary data.

A. SCENARIO

The foundation of any training exercise is the exercise scenario. It serves to facilitate accomplishment of training objectives established by the CINC, and involves two crucial aspects. The first consists of typical or *anticipated* events leading to the execution of a particular operations plan (OPLAN). These are understood by the staff *a priori*, are captured within the deliberate planning process, and serve as the basis for initial actions. The second aspect involves the evolution of the scenario as determined by the realization of outcomes. This is influenced largely by opposing force actions, but includes scripted events contained in the Master Scenario Events List (MSEL). The first aspect captures the state of the world at the start of the exercise; the second serves as the impetus for revisions to the base plan and on-going staff estimates.

In order to demonstrate the methodology, eight days of combat were simulated using primary ground combat units (i.e. infantry, armor, artillery) and their associated logistical support elements. Other requirements affecting scenario development in the demonstration include allowance for multiple phases, forced plan revision, and early stress on logistic resources. Allowance for multiple phases provides a framework from which to assess staff estimates as they change through the course of a campaign or major operation. Forcing revision of the initial plan is desired in order to demonstrate the fidelity and robustness of the methodology. Finally, because typical theater-level simulations start with all forces in theater and place virtually no constraints on logistics, hostilities commence *during* the deployment of forces into theater to stress resources early, thereby demonstrating the utility in using the simulation to assess logistics planning.

The scenario developed for the application is based upon a Major Regional Contingency (MRC) in Southwest Asia. Following a two day build-up along the Kuwaiti border, Iraqi forces secure and occupy

Kuwait. Sensing American commitment to the region, they attack to seize the AL Mish'ab and Manifah oil fields in Saudi Arabia prior to the closure of all US forces in order to increase their leverage in achieving a negotiated settlement. The initial CENTCOM OPLAN details a three-phase operation utilizing the XVIII Airborne Corps (ABC), VII Corps (both under the command of Third Army), and III Marine Expeditionary Force (MEF). Deployment commences on C day and is to conclude with all forces in theater and *in position to defend* Saudi Arabia by D=C+8 days. Offensive operations to remove Iraqi forces from Kuwait are anticipated to begin by D+4 (C+12) days.

At the time Iraq attacks into Saudi Arabia, only units of the XVIII ABC and III MEF are in position to defend. The plan is revised to allow for the continued deployment of the VII Corps into theater while XVIII ABC and III MEF conduct defensive operations. Anticipating the defense will succeed in forcing the withdrawal of Iraq from Saudi Arabia, offensive operations involving all forces are planned to commence on C+8 days. A time line depicting the concept of the scenario is provided in Figure 5. Details of each particular operation follow.

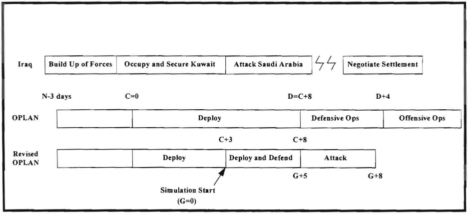


Figure 5. Scenario Concept

1. Defensive Operations, C+3 Days

Iraq attacks with a Corps of four Divisions into Saudi Arabia to seize the oil fields at Al Mish'ab and Manifah (Figure 6). The Nebuchadnezzar Republican Guards Division attacks along the coastal road as the Corps main attack. The Medina Republican Guards Division and the 16th Infantry Division conduct supporting attacks in the west to secure its flank. The 28th Infantry Division follows the Nebuchadnezzar and secures the Corps line of communication leading from Kuwait. US forces defend with the 24th

Mechanized Infantry Division forward in two brigade battle positions perpendicular to the primary high speed avenues of approach. The division is augmented by two battalions from the 11th Field Artillery Brigade, XVIII Corps Artillery. The 3d Marine Division defends south of the 1st Brigade, 24th Mechanized Infantry Division, along the coastal highway to interdict and ultimately block any penetration of that brigade's defense. The 101st Airborne Division (Air Assault) defends in brigade sectors south of the 2nd Brigade, 24th Mechanized Infantry Division and blocks any penetrations by the Medina or the 16th Infantry Divisions in their attacks towards Al Mish'ab. The 3d Armored Cavalry Regiment, consisting of one armored cavalry squadron and one MLRS battalion, serves as the Corps counterattack force.

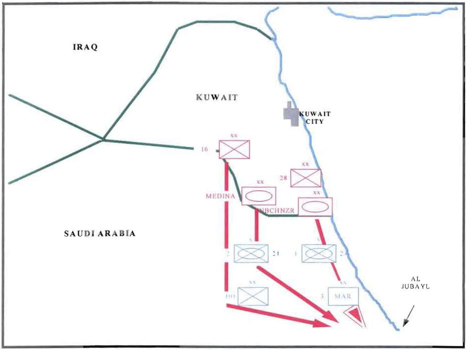


Figure 6. Defensive Operations, C+3 Days

2. Offensive Operations, C+8 Days

After being heavily attrited in their attack into Saudi Arabia, the four Iraqi divisions withdraw and occupy defensive positions in southern Kuwait. Three new divisions, the 10th and 52d Armored divisions (Republican Guards) and the 38th Infantry Division, having deployed south from Baghdad, are now

defending west of Kuwait along the disputed border. VII Corps forces have closed in theater, and offensive operations commence on C+8 (Figure 7). The 24th Mechanized Infantry Division conducts the theater main attack with its 1st (1/24) and 2nd (2/24) Brigades destroying remnants of the Medina and Nebuchadnezzar divisions, respectively. On order, it conducts a follow-on attack and destroys remnants of the 16th Infantry Division. Two brigades of the 101st support 1/24's attack against Medina, while its remaining brigade, together with the 3rd Armored Cavalry Regiment, support 2/24's attack against Nebuchadnezzar. The 3d Marine Division destroys remnants of the 28th Infantry Division and then secures Kuwait City. VII Corps conducts a supporting attack in the west to secure the flank of the XVIII ABC as it moves into Kuwait. The 1st Armored Division (US) conducts the Corps main attack against the 52nd Republican Guards Division. It is supported in the west by the 1st Armored Division (UK) by its attack against the 10th Republican Guards Division. The 2nd Infantry Division (UK) follows from the east and destroys the 38th Infantry Division.

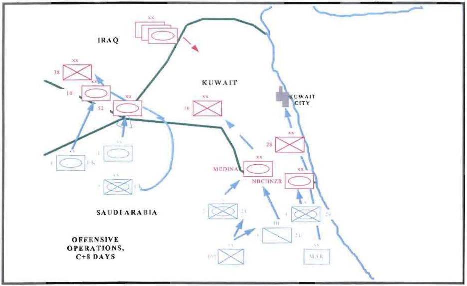


Figure 7. Offensive Operations, C+8 Days

3. Offensive Operations, C+9,10 Days

Three remaining Republican Guards Divisions are committed to Kuwait and threaten Kuwait City from the northwest. The 2nd Infantry Division (UK) and the 24th Mechanized Infantry Division conduct a coordinated attack against the Hammerabi Division in the south. In the north, the 1st Armored Division

(US) and the 1st Armored Division (UK) conduct a combined attack against the Baghdad Division, and in a follow-on operation, the 17th Armored Division. Remaining elements of the XVIII ABC consolidate on their previous day's objectives. The 3rd Marine Division continues its occupation of Kuwait City. Hostilities conclude at the end of C+10 (Figure 8). Sustainment issues of this campaign will now be discussed.

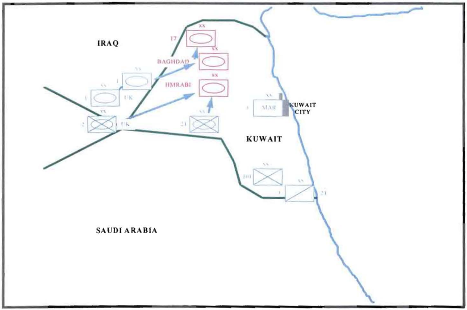
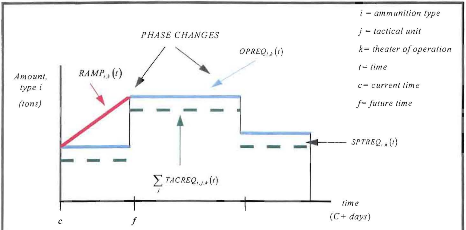


Figure 8. Offensive Operations, C+9-10 Days

B. REQUIREMENTS GENERATION AND PLAN REPRESENTATION

One of the primary concerns of the J-4 staff is the accurate forecasting of theater ammunition requirements. Figure 9 illustrates the functional relationship used to describe the operational-level requirement for a given type of ammunition across various phases of a operation. The relationship attempts to capture two important aspects. First, the operational requirement is greater than the sum of all tactical level requirements within the theater of operation. This means the operational commander's requirement encompasses those of the organizations within his theater as well as the additional stockage requirements maintained within the Communications Zone (COMMZ). Second, requirements at any given time include what is needed at that time, plus the *then-time* realization of future needs. This addresses the fact that greater future requirements are not instantaneously assumed in the future, but rather are gradually fulfilled

over time. Therefore, in estimating requirements, the staff must consider the rate at which supplies are expected to be consumed, and the additional rate at which forces must be resupplied to meet future needs.



$\sum_j TACREQ_{i,j,k}(t)$ ... *sum of tactical requirements (user specified)*

$SPTREQ_{i,k}(t)$ ... *operational stockages (user specified)*

$$OPREQ_{i,k}(t) = \sum_j TACREQ_{i,j,k}(t) + SPTREQ_{i,k}(t) + RAMP_{i,k}(t)$$

$$RAMP_{i,k}(t) = \begin{cases} \dfrac{FUTREQ_{i,k}(t=f) - CURREQ_{i,k}(t=c)}{f-c} & FUTREQ_{i,k} > CURREQ_{i,k} \\ 0 & otherwise \end{cases}$$

Figure 9. Ramp Function

1. Ramp Function

The ramp function is designed to capture the operational concerns in planning for future campaigns and major operations and is therefore explicitly expressed as a component of the operational requirement. However, in applying the methodology, growth is realized to be implicitly occurring at the tactical level where supplies are eventually consumed. In this example the "ramp" towards greater future requirements is depicted as a *linear monotonic increasing* function, thus implying requirements are increasing at a constant rate. Current realizations of future needs might increase at a reduced rate, but it is counter-intuitive to think they would decrease over some small interval of time as would be the case if the

function were nonmonotonic. This example is simplistically appealing and adequate for the purpose of demonstrating the methodology. However, in applying the methodology, a fundamental question the staff must address is, "What is the required growth rate and functional form for representing future requirements within the context of current operations?" For instance, if the staff anticipates that the current phase might be shorter in duration than planned, then more aggressive growth early in the phase would be desirable to ensure adequate resources are on-hand at the time of transition to the next phase. This suggests use of a logarithmic-type growth function. Conversely, if initial phase operations are planned in a relatively austere environment, growth towards future requirements might be better represented by a power function in recognition of the increasing availability of resources in theater.

2. Plan Implementation

Representation of key aspects of the staff's plan in the simulation is essential to the methodology. In doing this, the analyst should keep in mind that the goal of the training event is not to assess how good the plan is, but rather, how well tasks were executed in developing the plan. Methods chosen for portraying the plan should be simple, yet all-encompassing, in their ability to provide insight into crucial staff functions.

The focus of the analysis in the demonstration is to determine how well ammunition requirements were forecasted. Essential elements of the logistics plan were, therefore, taken to be ammunition requirements by type, per phase, for each friendly unit represented in the theater. Requirements were expressed as a function of the unit's basic load (in tons) for the respective type ammunition as given by the unit's *tactical unit prototype* (TUP) in the JTLS database. Specifically, the logistics plan stipulated routine requirements of one, two and three basic loads for deployment, defensive, and offensive operations phases, respectively. Growth towards increased future requirements was described in terms of a linear ramp function and therefore was dependent upon each unit's theater closure date. Additionally, a constant operational stockage requirement was determined for each of the four categories of ammunition.

Exact requirements were generated in an EXCEL spreadsheet to facilitate data manipulation and the input of orders into the simulation. EXCEL was chosen on the basis of its common availability and ease of use. It is extremely powerful, making it also beneficial for post-exercise analysis. Initially, only requirements for the base plan were determined. Again, the plan was based on a sixteen day scenario. Deployment phase concludes at C+7 days with all units prepared to conduct defensive operations by D=C+8 days. Offensive operations are assumed to commence on C+12 days and conclude by C+15. Figure10 provides an example layout of the spreadsheet as well as examples of the algebraic and logic functions developed to determine requirements. The complete spreadsheet for Class V is contained in Appendix B.

UNIT	CLOSE (Game Time)	BASIC LOAD (Tons)	DEPLOY (Tons)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8	9	10	11	12	13	14	15
				*	*	*	0	1	2	3	4	5	6	7	8	*	*	*	*
24DISCOMR	1.00	40.00	40.00	0.00	0.00	40.00	45.71	51.43	57.14	62.86	68.57	80.00	90.00	100.00	110.00	120.00	120.00	120.00	120.00
1BDE24MX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3/69ARBN	0.00	0.40	0.40	0.00	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.80	0.90	1.00	1.10	1.20	1.20	1.20	1.20
3/7IN24MX	0.00	4.80	4.80	0.00	4.80	5.40	6.00	6.60	7.20	7.80	8.40	9.60	10.80	12.00	13.20	14.40	14.40	14.40	14.40

*DEPLOY = 1 * BASIC LOAD*

$R_{(0)} = 0$

If CLOSE = 0, then $R_{(1)}$ *= DEPLOY*
else $R_{(1)} = 0$

$R_{(C)}$ *= 2 * BASIC LOAD*

$R_{(C)}$ *= ((ATTACK - DEFEND)/(defense duration))* + $R_{(C-1)}$

$R_{(C)}$ *= 3 * BASIC LOAD*

If CLOSE < C - 1, and If DEPLOY > BASIC LOAD, then $R_{(C)}$ *= DEPLOY*
else, $R_{(C)}$ *= ((DEFEND - DEPLOY)/(defend date - CLOSE))* + $R_{(C-1)}$
else, If CLOSE = C, then $R_{(C)}$ *= DEPLOY*
else, $R_{(C)} = 0$

where,

$R_{(C)}$ = *Ammunition requirement (tons), day C*

C = C date (C+ days)

CLOSE = *unit theater closure date (game time). Date on which unit is ready to conduct operations.*

BASIC LOAD = *unit basic load as specified by TUP*

DEPLOY = *unit deployment phase requirement*

DEFEND = *unit defensive operations phase requirement*

ATTACK = *unit offensive operations phase requirement*

Figure 10. Example of Base Plan Spreadsheet

The benefit of utilizing the spreadsheet to represent plan requirements became evident when forced to revise the plan following Iraq's early attack into Saudi Arabia. New requirements were quickly determined by slightly revising the existing functions. Day C+3 requirements for units committed to the defense were changed to two basic loads. Thereafter, they assumed a linear ramp function to achieve three basic loads by C+8. Likewise, requirements for units not committed to the defense were adjusted to reflect the steeper growth rate corresponding to an earlier attack date. The EXCEL spreadsheet developed for the revised plan Class V requirements is contained in Appendix C.

3. Orders Input

Another benefit of representing the plan in a spreadsheet is that the information can be quickly processed and formatted for direct use in the model. This allows orders to be stored in a file and sent when needed, precluding having to manually enter data. The correct sequencing of orders also provides a quick and efficient means for implementing the staff's plan without directly altering the model's data base. This

procedure can be applied to any situation in which routine aspects of a plan (i.e. daily logistics requests, movement orders, targeting, etc..) are manually input into the model. Players can conceivably start the exercise with a ninety percent solution with regard to certain taskings. This enhances the training event by reducing the workload of individuals in the gamer cells allowing them to devote more time to other duties.

The four quantities contained in the data base used to describe ammunition requirements for each tactical unit prototype are its "bring to theater" amount, basic load, reorder level, and stockage objective. The reorder level is an amount which, when reached, causes the unit to generate a requisition for resupply. Stockage objective provides a guideline for the amount to be requisitioned as defined by the following relationship. [Ref. 7: p. 6-18]

Amount Requisitioned = Stockage Objective - (On Hand + Due In - Amount Due to Others)

Generally speaking, however, logistics are not constrained in the simulation. Tactical Unit Prototype (TUP) reorder levels and stockage objectives in the data base are set to quantities that ensure adequate resources are always on-hand. Therefore, to prevent units from ordering above forecasted requirements, and to more accurately reflect the staff's plan, stockage objectives and reorder levels were changed daily to reflect the *next day's* requirement. Prior to the start of the exercise, the daily logistics orders were processed into the simulation through an ASCII file developed from the EXCEL spreadsheet in accordance with the algorithm described in Figure 11. These orders were called and sent to the respective units by the gamers a short increment of time *after* the start of each game day to ensure model driven orders implemented at the *exact* start of each game day were overridden. An example ASCII input file for Class V containing plan requirements for Class V is contained in Appendix D.

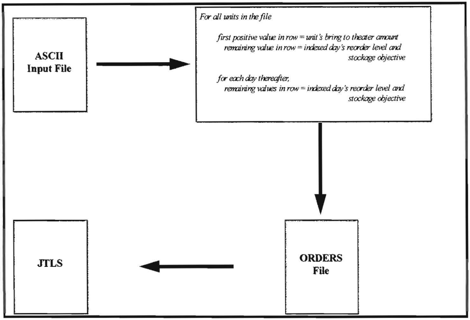


Figure 11. Orders Input Algorithm

C. POST PROCESSING

Routines for capturing values required for post exercise analysis were developed by Rolands and Associates, Inc. Changes in unit on-hand amounts for each of the four categories of ammunition considered were captured in a post-processed file that contained the unit, the time of the respective activity, the reason for the report, the category of ammunition, and the on-hand amount. The file was saved in ASCII format and imported into EXCEL for further sorting and analysis.

1. Sorting

The ultimate goal was the production of graphs allowing for comparisons of on-hand amounts against forecasted requirements over time for any unit or aggregation of units in theater. Achieving this required application of several sorting routines to the data contained in the output file. These primarily involved elimination of redundant entries and alignment of units to reflect the theater command structure.

2. Time-Correlated On-Hand Matrix

After the initial data were sorted, a unique time vector was constructed by sorting all report times remaining in the data and eliminating redundancies. This vector represented each time at which the on-hand amount of at least one unit in the theater changed during the course of the operation, and ultimately served as the abscissa in the comparison graph. The vector was transposed across the top of the spreadsheet and a simple logic function used to enter on-hand amounts for each respective unit under the appropriate time column. The results were reported value entries in the matrix giving the on-hand amount each time the value changed. Zero entries between values were replaced with the preceding reported value, thus producing a game-time continuous series of on-hand amounts by unit. Aggregate amounts were determined by summing across appropriate subordinate units. An example portion of one of the matrices developed for the analysis is provided in Appendix E.

D. ANALYSIS OF THEATER AMMUNITION REQUIREMENTS

Figure 12 shows a comparison of Theater forecasted requirements for Class V ammunition against actual on-hand amounts. The graph depicts expenditure of Class V during the defensive operation at a rate of approximately 370 tons per hour. The trough shown between days one and two is primarily explained by a large shipment sent from the 3d Army Support Group, the bulk of which arrives at the 18th COSCOM at the beginning of day two. The most obvious observation is that, except in the very beginning, on-hand amounts never equal forecasted requirements. This does not necessarily mean the plan was bad. Although the large magnitudes make it difficult to determine precisely, the slopes of the requirements and on-hand lines appear to closely parallel one another during days two through five (deployment phase). This is an indication that the ramp function accurately determined the required growth rate. Failure to meet requirements appears to be the result of a deficiency in accounting for consumption which is likely to have caused the introduction of a perpetual lag. This is evident by the downward sloping nature of the on-hand line during the defensive operations phase. Had consumption been perfectly accounted for, this line would have shown no downward trend, and given application of the ramp function, would have actually sloped upward. Still, how well the plan facilitated meeting requirements is only one aspect of its "quality." Another important concern is, "How good were the requirements?" In all instances, Blue forces *decisively* defeated Iraqi opposition. This in itself seems to suggest forecasts were over-stated. While this is obviously better than under estimation, it could adversely affect other areas by over burdening critical distribution resources.

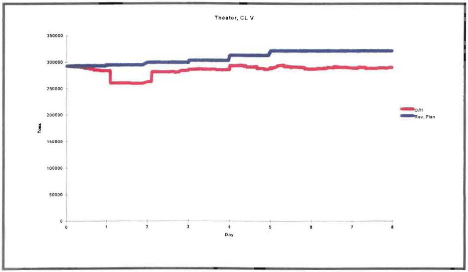


Figure 12. Comparison Graph, Theater CL V Requirements vs. On-Hand

Although the graph above provides a good overview, it lacks the resolution required for a detailed analysis. A more in-depth perspective can be obtained through examination of the graphs presented in Figures 13-16 which depict requirements versus on-hand usage of Class V and short-range surface-to-surface missiles in the 24th Mechanized and 1st Armored Divisions. Also illustrated are requirements developed for the initial OPLAN. Note that revised requirements for the 24th (Figures 13 and 14) depict an additive shift over the base plan because the Division, having already deployed to theater at the time the plan was revised, assumed the new requirements instantaneously. The 1st Armored, on the other hand, was subject to the revised plan from the time it arrived in theater and therefore realized only an increased growth rate (Figures 15 and 16).

Further analysis shows the 24th expended Class V at the approximate rate of 108 tons/hr during the defense (Figure 13). This is considerably higher than the theater average, and seems consistent with the Division's role as the main effort in the XVIII Airborne Corps' defense. The Division's on-hand curve also shows indications of the trough previously indicated in Figure 12. In comparison, arrival of requisitions seem to lag those arriving into the 18th COSCOM by approximately twelve hours. Following the re-establishment of requirements at the end of day 2, growth seems very consistent with increasing requirements until day 5. Growth in the 1st Armored Division, on the other hand, stops with the closure of all of its units at the beginning of day three (Figure 15).

The 7th Corps Support Command (COSCOM) did not arrive in theater until day 4, and was therefore unable to process requisitions from the Division. A two day lag resulted in delivering requirements of approximately 2000 tons due to shipment and handling times involved.

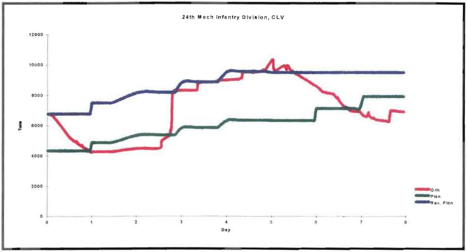


Figure 13. Comparison Graph, 24th Mech Inf. Div. CL V Requirements vs. On-Hand

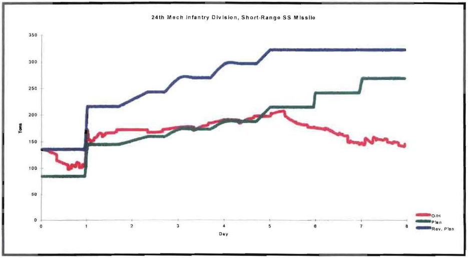


Figure 14. Comparison Graph, 24th Mech Inf. Div. SR-SS Missile Requirements vs. On-Hand

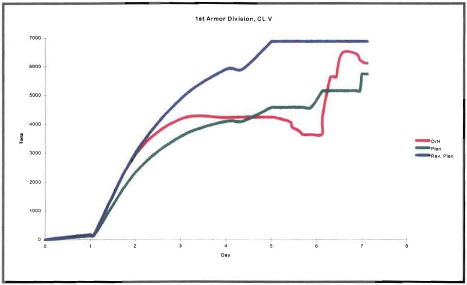


Figure 15. Comparison Graph, 1st Armored Div. CL V Requirements vs. On-Hand

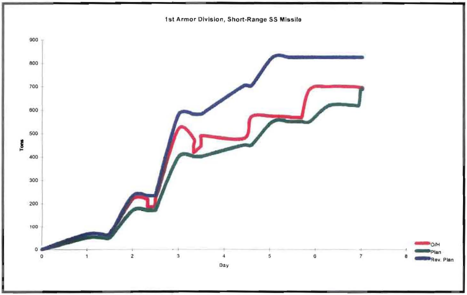


Figure 16. Comparison Graph, 1st Armored Div. SR-SS Missile Requirements vs. On-Hand

E. CONCLUSIONS

The results presented above serve to demonstrate methods by which the logistics plans can be evaluated in post exercise analysis. These methods do not, by themselves, indicate whether a plan was "good" or "bad." Rather, when used in conjunction with similar graphical portrayals from other sustainment task functional areas such as "Distributing Supplies," or other tasks areas such as "Intelligence," a complete picture of causal reasons for significant observed outcomes is derived. Furthermore, data captured can be used to establish an audit trail linking critical issues to measures addressing task performance.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

This research developed a computer-aided exercise analysis methodology for evaluating the performance of logistics functions as they pertain to selected universal joint tasks. Although discussion has concentrated exclusively on the areas of sustainment and support, principles of the methodology are applicable to the entire spectrum of tasks in the UJTL. The methodology is not intended to assess execution of joint tasks. Its focus is on evaluating *process* performance that ultimately is used to provide insight to significant events observed during the exercise. The methodology encompasses two parts. The first part concentrates on development of MOPs and MOEs for tasks specified in the CINCs exercise training objectives. This entails a functional approach to analyzing inherent issues and determining data requirements. The second part involves representing essential elements of the staff's plan within the simulation and developing procedures for extracting data necessary to the analysis.

One strength of the methodology is that its implementation places no burden on the staff during the course of the exercise. It actually helps to reduce model-driven workload in "gamer" cells by automating orders input, thus allowing them to be more responsive to the needs of the staff. A second strength of the methodology is that it provides efficient means for embedding the staff's plan in the simulation. JTLS is extremely powerful. Its inherent procedures and data structures are capable of representing virtually all functions pertinent to military operations. Although some functions lack the fidelity desired, in the interest of process analysis, the exercise planner should assume the model is capable of adequately representing essential elements of the staff's plan and producing data beneficial to post-exercise analysis. A third strength of the methodology is that it is relatively uncomplicated and conducive to the production of quick and insightful analysis.

B. RECOMMENDATIONS

Recommendations for future study encompass three distinct areas. These are the analysis approach, methodology refinement, and model (simulation) improvement. The analysis approach concerns application of the methodology to alternative relationships describing task groupings. The approach in this thesis involved grouping tasks across levels of war within a particular task area according to common functionality (i.e. arming, fueling, maintaining, etc.). An alternative analysis approach would be to group tasks in a mission or operational concept perspective (amphibious assault, humanitarian relief, battle group escort, etc.). This approach would better support the alignment of CINC training objectives (described in terms of universal joint tasks) with exercise design.

Methodology refinement pertains to continued development of post-processing requirements to allow for more expeditious analysis. Post-processing in this research involved two aspects. The first required determining needed information and the development of algorithms for capturing and writing results to an output file. This portion utilized the new external post processor available in the latest version of JTLS. The second aspect primarily involved operations performed on the output file in preparing the results for presentation. The operations required a considerable amount of time and would not be conducive to large-scale analysis. Better use of the model's post processor would have substantially reduced analysis time. However, fully utilizing this capability requires *precise* determination of data requirements during exercise planning and design.

Methodology refinement also includes utilizing research completed by Dynamics Research Corporation in developing measures. Results of this effort are beneficial to application of the methodology because they incorporate the experience and expertise of the senior leadership within DOD. Using task measures developed exclusively for the UJTL as a baseline would allow more effort to be focused on developing the precise relationships among task groupings.

Simulation improvement primarily concerns increasing model fidelity. For example, JTLS currently has limited ability to provide insight into maintenance and repair processes. Destroyed and damaged combat systems are repaired and replaced in the model, but only in the sense of representing a phenomena, and not in a manner that is conducive to analysis. Recommendations for improvement include stochastically determining maintenance losses in addition to battle losses, and dynamically representing restorative capabilities (e.g. repair parts, personnel skills, special equipment, replacement authority, etc.) at each level of war. This would allow for implementation of staff plans and policies in the model, thereby increasing its ability to provide insight.

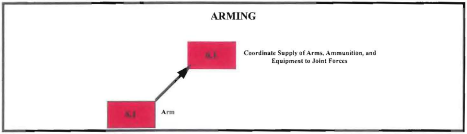


Figure A-1. Arming Forces

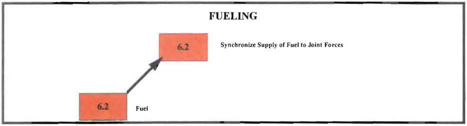


Figure A-2. Fueling Forces

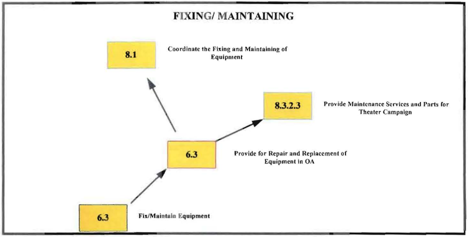


Figure A-3. Fixing/Maintaining

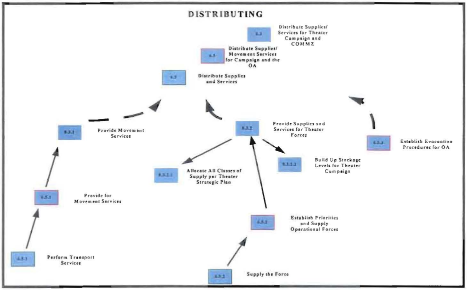


Figure A-4. Distributing

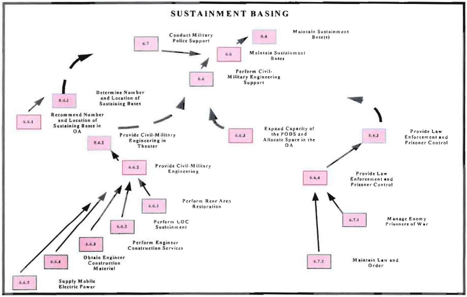


Figure A-5. Sustainment Basing

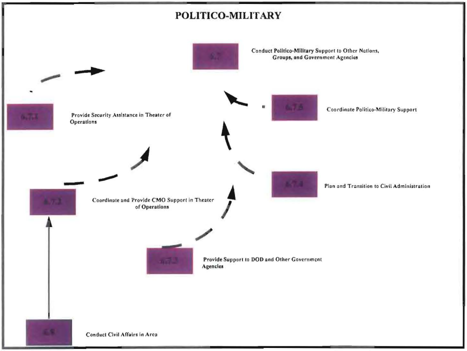


Figure A-6. Politico-Military

APPENDIX B. BASE PLAN AMMUNITION REQUIREMENTS (CLV)

The spreadsheet below gives unit Class V ammunition requirements (tons) for all sixteen days of the operation in accordance with the base plan. The red, yellow, and blue column headings show C + days corresponding to the deployment, defensive, and offensive operations phases, respectively. The reported closure date is the first day in which the given unit was available to conduct operations. Requirements for the revised plan are given in Appendix C.

UNIT	CLOSE	BASIC LOAD	DEPLOY																
	(Game Time)	(Tons)	(Tons)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CENTCOM	0.00	2.55	2.55	0.00	2.55	2.91	3.28	3.64	4.01	4.37	4.74	5.10	5.74	6.38	7.01	7.65	7.65	7.65	7.65
3DARMY	0.00	7.66	7.66	0.00	7.66	8.75	9.85	10.94	12.04	13.13	14.23	15.32	17.24	19.15	21.07	22.98	22.98	22.98	22.98
3ARMY ASG	0.00	99.00	99.00	0.00	99.00	113.14	127.29	141.43	155.57	169.71	183.86	198.00	222.75	247.50	272.25	297.00	297.00	297.00	297.00
XVIIIABC	0.00	7.60	7.60	0.00	7.60	8.69	9.77	10.86	11.94	13.03	14.11	15.20	17.10	19.00	20.90	22.80	22.80	22.80	22.80
18COSCOMF	0.00	7.00	7.00	0.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.75	17.50	19.25	21.00	21.00	21.00	21.00
18COSCOMR	1.00	7.00	7.00	0.00	0.00	7.00	8.17	9.33	10.50	11.67	12.83	14.00	15.75	17.50	19.25	21.00	21.00	21.00	21.00
XVIIIFA	1.00	2.91	2.91	0.00	0.00	2.91	3.40	3.88	4.37	4.85	5.34	5.82	6.55	7.28	8.00	8.73	8.73	8.73	8.73
11FABDE18	1.00	2.91	2.91	0.00	0.00	2.91	3.40	3.88	4.37	4.85	5.34	5.82	6.55	7.28	8.00	8.73	8.73	8.73	8.73
1/11FABN	0.00	282.12	282.12	0.00	282.12	322.42	362.73	403.03	443.33	483.63	523.94	564.24	634.77	705.30	775.83	846.36	846.36	846.36	846.36
2/11FABN	0.00	282.12	282.12	0.00	282.12	322.42	362.73	403.03	443.33	483.63	523.94	564.24	634.77	705.30	775.83	846.36	846.36	846.36	846.36
3/11FABN	1.00	26.58	26.58	0.00	0.00	26.58	31.01	35.44	39.87	44.30	48.73	53.16	59.81	66.45	73.10	79.74	79.74	79.74	79.74
HQ101ABD	0.00	7.60	7.60	0.00	7.60	8.69	9.77	10.86	11.94	13.03	14.11	15.20	17.10	19.00	20.90	22.80	22.80	22.80	22.80
101DISCOM	0.00	7.00	7.00	0.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.75	17.50	19.25	21.00	21.00	21.00	21.00
HQ3BDE101	0.00	0.97	0.97	0.00	0.97	1.11	1.25	1.39	1.52	1.66	1.80	1.94	2.18	2.43	2.67	2.91	2.91	2.91	2.91
1/187IN	0.00	81.75	81.75	0.00	81.75	93.43	105.11	116.79	128.46	140.14	151.82	163.50	183.94	204.38	224.81	245.25	245.25	245.25	245.25
2/187IN	0.00	81.75	81.75	0.00	81.75	93.43	105.11	116.79	128.46	140.14	151.82	163.50	183.94	204.38	224.81	245.25	245.25	245.25	245.25
3/187IN	0.00	81.75	81.75	0.00	81.75	93.43	105.11	116.79	128.46	140.14	151.82	163.50	183.94	204.38	224.81	245.25	245.25	245.25	245.25
HQ1BDE101	0.00	0.97	0.97	0.00	0.97	1.11	1.25	1.39	1.52	1.66	1.80	1.94	2.18	2.43	2.67	2.91	2.91	2.91	2.91
1/327INBN	0.00	81.75	81.75	0.00	81.75	93.43	105.11	116.79	128.46	140.14	151.82	163.50	183.94	204.38	224.81	245.25	245.25	245.25	245.25
2/327INBN	0.00	81.75	81.75	0.00	81.75	93.43	105.11	116.79	128.46	140.14	151.82	163.50	183.94	204.38	224.81	245.25	245.25	245.25	245.25
3/327INBN	0.00	81.75	81.75	0.00	81.75	93.43	105.11	116.79	128.46	140.14	151.82	163.50	183.94	204.38	224.81	245.25	245.25	245.25	245.25
HQ2BDE101	0.00	0.97	0.97	0.00	0.97	1.11	1.25	1.39	1.52	1.66	1.80	1.94	2.18	2.43	2.67	2.91	2.91	2.91	2.91
1/502INBN	0.00	81.75	81.75	0.00	81.75	93.43	105.11	116.79	128.46	140.14	151.82	163.50	183.94	204.38	224.81	245.25	245.25	245.25	245.25
2/502INBN	0.00	81.75	81.75	0.00	81.75	93.43	105.11	118.79	128.46	140.14	151.82	163.50	183.94	204.38	224.81	245.25	245.25	245.25	245.25
3/502INBN	0.00	81.75	81.75	0.00	81.75	93.43	105.11	116.79	128.46	140.14	151.82	163.50	183.94	204.38	224.81	245.25	245.25	245.25	245.25
101DIVFA	0.00	2555.40	2555.40	0.00	2555.40	2920.46	3285.51	3650.57	4015.63	4380.69	4745.74	5110.80	5749.65	6388.50	7027.35	7666.20	7666.20	7666.20	7666.20
3/320FA	0.00	282.12	282.12	0.00	282.12	322.42	362.73	403.03	443.33	483.63	523.94	564.24	634.77	705.30	775.83	846.36	846.36	846.36	846.36
1/320FABN	0.00	282.12	282.12	0.00	282.12	322.42	362.73	403.03	443.33	483.63	523.94	564.24	634.77	705.30	775.83	846.36	846.36	846.36	846.36
2/320FABN	0.00	282.12	282.12	0.00	282.12	322.42	362.73	403.03	443.33	483.63	523.94	564.24	634.77	705.30	775.83	846.36	846.36	846.36	846.36
HQ24MECH	0.00	18.00	18.00	0.00	18.00	20.57	23.14	25.71	28.29	30.86	33.43	36.00	40.50	45.00	49.50	54.00	54.00	54.00	54.00
24DISCOMF	0.00	7.00	7.00	0.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.75	17.50	19.25	21.00	21.00	21.00	21.00
24DISCOMR	1.00	7.00	7.00	0.00	0.00	7.00	8.17	9.33	10.50	11.67	12.83	14.00	15.75	17.50	19.25	21.00	21.00	21.00	21.00
1BDE24MX	0.00	0.97	0.97	0.00	0.97	1.11	1.25	1.39	1.52	1.66	1.80	1.94	2.18	2.43	2.67	2.91	2.91	2.91	2.91
3/69ARBN	0.00	250.00	250.00	0.00	250.00	285.71	321.43	357.14	392.86	428.57	464.29	500.00	562.50	625.00	687.50	750.00	750.00	750.00	750.00
3/7IN24MX	0.00	165.06	165.06	0.00	165.06	188.64	212.22	235.80	259.38	282.96	306.54	330.12	371.39	412.65	453.92	495.18	495.18	495.18	495.18
22/7INBN	0.00	165.06	165.06	0.00	165.06	188.64	212.22	235.80	259.38	282.96	306.54	330.12	371.39	412.65	453.92	495.18	495.18	495.18	495.18
24DIVARTY	0.00	410.38	410.38	0.00	410.38	469.01	527.63	586.26	644.88	703.51	762.13	820.76	923.36	1025.95	1128.55	1231.14	1231.14	1231.14	1231.14
3/41FABN	0.00	410.38	410.38	0.00	410.38	469.01	527.63	586.26	644.88	703.51	762.13	820.76	923.36	1025.95	1128.55	1231.14	1231.14	1231.14	1231.14
1/41FABN	0.00	410.38	410.38	0.00	410.38	469.01	527.63	586.26	644.88	703.51	762.13	820.76	923.36	1025.95	1128.55	1231.14	1231.14	1231.14	1231.14
3ARCAVREGT	0.00	81.40	81.40	0.00	81.40	93.03	104.66	116.29	127.91	139.54	151.17	162.80	183.15	203.50	223.85	244.20	244.20	244.20	244.20
1/3ARMCAV	0.00	234.22	234.22	0.00	234.22	267.68	301.14	334.60	368.06	401.52	434.98	468.44	527.00	585.55	644.11	702.66	702.66	702.66	702.66
2BDE24MX	0.00	0.97	0.97	0.00	0.97	1.11	1.25	1.39	1.52	1.66	1.80	1.94	2.18	2.43	2.67	2.91	2.91	2.91	2.91
1/64ARBN	0.00	250.00	250.00	0.00	250.00	285.71	321.43	357.14	392.86	428.57	464.29	500.00	562.50	625.00	687.50	750.00	750.00	750.00	750.00
3/15INBN	0.00	165.06	165.06	0.00	165.06	188.64	212.22	235.80	259.38	282.96	306.54	330.12	371.39	412.65	453.92	495.18	495.18	495.18	495.18
4/64ARBN	0.00	250.00	250.00	0.00	250.00	285.71	321.43	357.14	392.86	428.57	464.29	500.00	562.50	625.00	687.50	750.00	750.00	750.00	750.00
VIICORPS	1.00	18.00	18.00	0.00	0.00	18.00	21.00	24.00	27.00	30.00	33.00	36.00	40.50	45.00	49.50	54.00	54.00	54.00	54.00
7COSCOM	4.00	7.00	7.00	0.00	0.00	0.00	0.00	0.00	7.00	9.33	11.67	14.00	15.75	17.50	19.25	21.00	21.00	21.00	21.00
VIIFA	1.00	0.97	0.97	0.00	0.00	0.97	1.13	1.29	1.46	1.62	1.78	1.94	2.18	2.43	2.67	2.91	2.91	2.91	2.91
9FABDEVII	2.00	0.97	0.97	0.00	0.00	0.00	0.97	1.16	1.36	1.55	1.75	1.94	2.18	2.43	2.67	2.91	2.91	2.91	2.91
1/9FABN	2.00	282.12	282.12	0.00	0.00	0.00	282.12	338.54	394.97	451.39	507.82	564.24	634.77	705.30	775.83	846.36	846.36	846.36	846.36
2/9FABN	3.00	282.12	282.12	0.00	0.00	0.00	0.00	282.12	352.65	423.18	493.71	564.24	634.77	705.30	775.83	846.36	846.36	846.36	846.36
3/9FABN	4.00	26.58	26.58	0.00	0.00	0.00	0.00	0.00	26.58	35.44	44.30	53.16	59.81	66.45	73.10	79.74	79.74	79.74	79.74
1ARMDIV	1.00	33.56	33.56	0.00	0.00	33.56	39.15	44.75	50.34	55.93	61.53	67.12	75.51	83.90	92.29	100.68	100.68	100.68	100.68
1DISCOMR	3.00	7.00	7.00	0.00	0.00	0.00	0.00	7.00	8.75	10.50	12.25	14.00	15.75	17.50	19.25	21.00	21.00	21.00	21.00
1DISCOM	1.00	7.00	7.00	0.00	0.00	7.00	8.17	9.33	10.50	11.67	12.83	14.00	15.75	17.50	19.25	21.00	21.00	21.00	21.00
1ARBDE1AR	1.00	0.97	0.97	0.00	0.00	0.97	1.13	1.29	1.46	1.62	1.78	1.94	2.18	2.43	2.67	2.91	2.91	2.91	2.91
1/5INBN	1.00	63.03	63.03	0.00	0.00	63.03	73.54	84.04	94.55	105.05	115.56	126.06	141.82	157.58	173.33	189.09	189.09	189.09	189.09
2/12ARRGT	2.00	255.63	255.63	0.00	0.00	0.00	255.63	306.78	357.88	409.01	460.13	511.26	575.17	639.08	702.98	766.89	766.89	766.89	766.89
1/8ARBN	2.00	250.00	250.00	0.00	0.00	0.00	250.00	300.00	350.00	400.00	450.00	500.00	562.50	625.00	687.50	750.00	750.00	750.00	750.00
2ARBDE1AR	2.00	0.97	0.97	0.00	0.00	0.00	0.97	1.16	1.36	1.55	1.75	1.94	2.18	2.43	2.67	2.91	2.91	2.91	2.91
1/12ARRGT	2.00	250.00	250.00	0.00	0.00	0.00	250.00	300.00	350.00	400.00	450.00	500.00	562.50	625.00	687.50	750.00	750.00	750.00	750.00
2/5ARBN	2.00	250.00	250.00	0.00	0.00	0.00	250.00	300.00	350.00	400.00	450.00	500.00	562.50	625.00	687.50	750.00	750.00	750.00	750.00
2/8ARBN	2.00	250.00	250.00	0.00	0.00	0.00	250.00	300.00	350.00	400.00	450.00	500.00	562.50	625.00	687.50	750.00	750.00	750.00	750.00
3ARBDE1AR	3.00	0.97	0.97	0.00	0.00	0.00	0.00	0.97	1.21	1.46	1.70	1.94	2.18	2.43	2.67	2.91	2.91	2.91	2.91
5/6INBNMX	3.00	165.06	165.06	0.00	0.00	0.00	0.00	165.06	206.33	247.59	288.86	330.12	371.39	412.65	453.92	495.18	495.18	495.18	495.18
7/6INBNMX	3.00	165.06	165.06	0.00	0.00	0.00	0.00	165.06	206.33	247.59	288.86	330.12	371.39	412.65	453.92	495.18	495.18	495.18	495.18
2INDIV.UK	3.00	7.66	7.66	0.00	0.00	0.00	0.00	7.66	9.58	11.49	13.41	15.32	17.24	19.15	21.07	22.98	22.98	22.98	22.98
2DSDBN	4.00	7.00	7.00	0.00	0.00	0.00	0.00	0.00	7.00	9.33	11.67	14.00	15.75	17.50	19.25	21.00	21.00	21.00	21.00
1INRGT	3.00	87.78	87.78	0.00	0.00	0.00	0.00	87.78	109.73	131.67	153.62	175.56	197.51	219.45	241.40	263.34	263.34	263.34	263.34
2FARGT	4.00	2555.40	2555.40	0.00	0.00	0.00	0.00	0.00	2555.40	3407.20	4259.00	5110.80	5749.65	6388.50	7027.35	7666.20	7666.20	7666.20	7666.20
2INRGT	4.00	87.78	87.78	0.00	0.00	0.00	0.00	0.00	87.78	117.04	146.30	175.56	197.51	219.45	241.40	263.34	263.34	263.34	263.34
2TKBN	4.00	250.00	250.00	0.00	0.00	0.00	0.00	0.00	250.00	333.33	416.67	500.00	562.50	625.00	687.50	750.00	750.00	750.00	750.00
3INRGT	4.00	87.78	87.78	0.00	0.00	0.00	0.00	0.00	87.78	117.04	146.30	175.56	197.51	219.45	241.40	263.34	263.34	263.34	263.34
1ARDIV.UK	5.00	33.56	33.56	0.00	0.00	0.00	0.00	0.00	0.00	33.56	50.34	67.12	75.51	83.90	92.29	100.68	100.68	100.68	100.68
1DSBN	5.00	7.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	10.50	14.00	15.75	17.50	19.25	21.00	21.00	21.00	21.00
1ARCAV	5.00	81.40	81.40	0.00	0.00	0.00	0.00	0.00	0.00	81.40	122.10	162.80	183.15	203.50	223.85	244.20	244.20	244.20	244.20
1ARRGT	5.00	255.63	255.63	0.00	0.00	0.00	0.00	0.00	0.00	255.63	383.45	511.26	575.17	639.08	702.98	766.89	766.89	766.89	766.89
1FARGT	5.00	410.38	410.38	0.00	0.00	0.00	0.00	0.00	0.00	410.38	615.57	820.76	923.36	1025.95	1128.55	1231.14	1231.14	1231.14	1231.14
2ARRGT	5.00	255.63	255.63	0.00	0.00	0.00	0.00	0.00	0.00	255.63	383.45	511.26	575.17	639.08	702.98	766.89	766.89	766.89	766.89
3ARRGT	5.00	255.63	255.63	0.00	0.00	0.00	0.00	0.00	0.00	255.63	383.45	511.26	575.17	639.08	702.98	766.89	766.89	766.89	766.89
IIMEF	2.00	18.00	18.00	0.00	0.00	0.00	18.00	21.60	25.20	28.80	32.40	36.00	40.50	45.00	49.50	54.00	54.00	54.00	54.00
3FSSG.MAR	0.00	99.00	99.00	0.00	99.00	113.14	127.29	141.43	155.57	169.71	183.86	198.00	222.75	247.50	272.25	297.00	297.00	297.00	297.00
3MAR.DIV	0.00	18.00	18.00	0.00	18.00	20.57	23.14	25.71	28.29	30.86	33.43	36.00	40.50	45.00	49.50	54.00	54.00	54.00	54.00
12MAR.HQ	0.00	0.97	0.97	0.00	0.97	1.11	1.25	1.39	1.52	1.66	1.80	1.94	2.18	2.43	2.67	2.91	2.91	2.91	2.91
1/11MAR.E	0.00	100.00	100.00	0.00	100.00	114.29	128.57	142.86	157.14	171.43	185.71	200.00	225.00	250.00	275.00	300.00	300.00	300.00	300.00
1/11MAR.P	0.00	2.00	2.00	0.00	2.00	2.29	2.57	2.86	3.14	3.43	3.71	4.00	4.50	5.00	5.50	6.00	6.00	6.00	6.00
2/12MAR	0.00	282.12	282.12	0.00	282.12	322.42	362.73	403.03	443.33	483.63	523.94	564.24	634.77	705.30	775.83	846.36	846.36	846.36	846.36
1LAR.BN.E	0.00	25.15	25.15	0.00	25.15	28.74	32.34	35.93	39.52	43.11	46.71	50.30	56.59	62.88	69.16	75.45	75.45	75.45	75.45
1LAR.BN.P	0.00	2.00	2.00	0.00	2.00	2.29	2.57	2.86	3.14	3.43	3.71	4.00	4.50	5.00	5.50	6.00	6.00	6.00	6.00
4MAR.RGT	0.00	0.97	0.97	0.00	0.97	1.11	1.25	1.39	1.52	1.66	1.80	1.94	2.18	2.43	2.67	2.91	2.91	2.91	2.91
2/2.MAR	0.00	87.78	87.78	0.00	87.78	100.32	112.86	125.40	137.94	150.48	163.02	175.56	197.51	219.45	241.40	263.34	263.34	263.34	263.34
2/8.MAR.E	0.00	100.00	100.00	0.00	100.00	114.29	128.57	142.86	157.14	171.43	185.71	200.00	225.00	250.00	275.00	300.00	300.00	300.00	300.00
2/8.MAR.P	0.00	2.00	2.00	0.00	2.00	2.29	2.57	2.86	3.14	3.43	3.71	4.00	4.50	5.00	5.50	6.00	6.00	6.00	6.00

APPENDIX C. REVISED PLAN AMMUNITION REQUIREMENTS (CLV)

The spreadsheet below gives unit Class V ammunition requirements (tons) for all sixteen days of the operation in accordance with the revised plan. The red, yellow, blue, and green column headings show C + days corresponding to the deployment, defensive, offensive, and consolidation operations phases, respectively. Actual simulated dates are bordered.

UNIT	CLOSE	BASIC LOAD	DEPLOY																
	(Game Time)	(Tons)	(Tons)	[illegible]	[illegible]	[illegible]	3	4	5	6	7	8	9	10	11	[illegible]	[illegible]	[illegible]	[illegible]
CENTCOM	0.00	2.55	2.55	0.00	2.55	3.28	5.10	5.61	6.12	6.63	7.14	7.65	7.65	7.65	7.65	2.55	2.55	2.55	2.55
THIRDARMY	0.00	7.66	7.66	0.00	7.66	9.85	15.32	16.85	18.38	19.92	21.45	22.98	22.98	22.98	22.98	7.66	7.66	7.66	7.66
3ARMY.ASG	0.00	99.00	99.00	0.00	99.00	127.29	198.00	217.80	237.60	257.40	277.20	297.00	297.00	297.00	297.00	99.00	99.00	99.00	99.00
XVIIIABC	0.00	7.60	7.60	0.00	7.60	9.77	15.20	16.72	18.24	19.76	21.28	22.80	22.80	22.80	22.80	7.60	7.60	7.60	7.60
18COSCOMF	0.00	7.00	7.00	0.00	7.00	9.00	14.00	15.40	16.80	18.20	19.60	21.00	21.00	21.00	21.00	7.00	7.00	7.00	7.00
18COSCOMR	1.00	7.00	7.00	0.00	0.00	7.00	9.33	11.67	14.00	16.33	18.67	21.00	21.00	21.00	21.00	7.00	7.00	7.00	7.00
XVIIIFA	1.00	2.91	2.91	0.00	0.00	2.91	3.88	4.85	5.82	6.79	7.76	8.73	8.73	8.73	8.73	2.91	2.91	2.91	2.91
11FABDE18	1.00	2.91	2.91	0.00	0.00	2.91	3.88	4.85	5.82	6.79	7.76	8.73	8.73	8.73	8.73	2.91	2.91	2.91	2.91
1/11FABN	0.00	282.12	282.12	0.00	282.12	362.73	564.24	620.66	677.09	733.51	789.94	846.36	846.36	846.36	846.36	282.12	282.12	282.12	282.12
2/11FABN	0.00	282.12	282.12	0.00	282.12	362.73	564.24	620.66	677.09	733.51	789.94	846.36	846.36	846.36	846.36	282.12	282.12	282.12	282.12
3/11FABN	1.00	26.58	26.58	0.00	0.00	26.58	35.44	44.30	53.16	60.75	69.61	79.74	79.74	79.74	79.74	26.58	26.58	26.58	26.58
HQ101ABD	0.00	7.60	7.60	0.00	7.60	9.77	15.20	16.72	18.24	19.76	21.28	22.80	22.80	22.80	22.80	7.60	7.60	7.60	7.60
101DISCOM	0.00	7.00	7.00	0.00	7.00	9.00	14.00	15.40	16.80	18.20	19.60	21.00	21.00	21.00	21.00	7.00	7.00	7.00	7.00
HQ3BDE101	0.00	0.97	0.97	0.00	0.97	1.25	1.94	2.13	2.33	2.52	2.72	2.91	2.91	2.91	2.91	0.97	0.97	0.97	0.97
1/187IN	0.00	81.75	81.75	0.00	81.75	105.11	163.50	179.85	196.20	212.55	228.90	245.25	245.25	245.25	245.25	81.75	81.75	81.75	81.75
2/187IN	0.00	81.75	81.75	0.00	81.75	105.11	163.50	179.85	196.20	212.55	228.90	245.25	245.25	245.25	245.25	81.75	81.75	81.75	81.75
3/187IN	0.00	81.75	81.75	0.00	81.75	105.11	163.50	179.85	196.20	212.55	228.90	245.25	245.25	245.25	245.25	81.75	81.75	81.75	81.75
HQ1BDE101	0.00	0.97	0.97	0.00	0.97	1.25	1.94	2.13	2.33	2.52	2.72	2.91	2.91	2.91	2.91	0.97	0.97	0.97	0.97
1/327INBN	0.00	81.75	81.75	0.00	81.75	105.11	163.50	179.85	196.20	212.55	228.90	245.25	245.25	245.25	245.25	81.75	81.75	81.75	81.75
2/327INBN	0.00	81.75	81.75	0.00	81.75	105.11	163.50	179.85	196.20	212.55	228.90	245.25	245.25	245.25	245.25	81.75	81.75	81.75	81.75
3/327INBN	0.00	81.75	81.75	0.00	81.75	105.11	163.50	179.85	196.20	212.55	228.90	245.25	245.25	245.25	245.25	81.75	81.75	81.75	81.75
HQ2BDE101	0.00	0.97	0.97	0.00	0.97	1.25	1.94	2.13	2.33	2.52	2.72	2.91	2.91	2.91	2.91	0.97	0.97	0.97	0.97
1/502INBN	0.00	81.75	81.75	0.00	81.75	105.11	163.50	179.85	196.20	212.55	228.90	245.25	245.25	245.25	245.25	81.75	81.75	81.75	81.75
2/502INBN	0.00	81.75	81.75	0.00	81.75	105.11	163.50	179.85	196.20	212.55	228.90	245.25	245.25	245.25	245.25	81.75	81.75	81.75	81.75
3/502INBN	0.00	81.75	81.75	0.00	81.75	105.11	163.50	179.85	196.20	212.55	228.90	245.25	245.25	245.25	245.25	81.75	81.75	81.75	81.75
101DIVFA	0.00	2555.40	2555.40	0.00	2555.40	3285.51	5110.80	5621.88	6132.96	6644.04	7155.12	7666.20	7666.20	7666.20	7666.20	2555.40	2555.40	2555.40	2555.40
3/320FA	0.00	282.12	282.12	0.00	282.12	362.73	564.24	620.66	677.09	733.51	789.94	846.36	846.36	846.36	846.36	282.12	282.12	282.12	282.12
1/320FABN	0.00	282.12	282.12	0.00	282.12	362.73	564.24	620.66	677.09	733.51	789.94	846.36	846.36	846.36	846.36	282.12	282.12	282.12	282.12
2/320FABN	0.00	282.12	282.12	0.00	282.12	362.73	564.24	620.66	677.09	733.51	789.94	846.36	846.36	846.36	846.36	282.12	282.12	282.12	282.12
HQ24MECH	0.00	18.00	18.00	0.00	18.00	23.14	36.00	39.60	43.20	46.80	50.40	54.00	54.00	54.00	54.00	18.00	18.00	18.00	18.00
24DISCOMF	0.00	7.00	7.00	0.00	7.00	9.00	14.00	15.40	16.80	18.20	19.60	21.00	21.00	21.00	21.00	7.00	7.00	7.00	7.00
24DISCOMR	1.00	7.00	7.00	0.00	0.00	7.00	9.33	11.67	14.00	16.33	18.67	21.00	21.00	21.00	21.00	7.00	7.00	7.00	7.00
1BDE24MX	0.00	0.97	0.97	0.00	0.97	1.25	1.94	2.13	2.33	2.52	2.72	2.91	2.91	2.91	2.91	0.97	0.97	0.97	0.97
3/69ARBN	0.00	250.00	250.00	0.00	250.00	321.43	500.00	550.00	600.00	650.00	700.00	750.00	750.00	750.00	750.00	250.00	250.00	250.00	250.00
3/7IN24MX	0.00	165.06	165.06	0.00	165.06	212.22	330.12	363.13	396.14	429.16	462.17	495.18	495.18	495.18	495.18	165.06	165.06	165.06	165.06
22/7INBN	0.00	165.06	165.06	0.00	165.06	212.22	330.12	363.13	396.14	429.16	462.17	495.18	495.18	495.18	495.18	165.06	165.06	165.06	165.06
24DIVARTY	0.00	410.38	410.38	0.00	410.38	527.63	820.76	902.84	984.91	1066.99	1149.06	1231.14	1231.14	1231.14	1231.14	410.38	410.38	410.38	410.38
3/41FABN	0.00	410.38	410.38	0.00	410.38	527.63	820.76	902.84	984.91	1066.99	1149.06	1231.14	1231.14	1231.14	1231.14	410.38	410.38	410.38	410.38
1/41FABN	0.00	410.38	410.38	0.00	410.38	527.63	820.76	902.84	984.91	1066.99	1149.06	1231.14	1231.14	1231.14	1231.14	410.38	410.38	410.38	410.38
3ARCAVRGT	0.00	81.40	81.40	0.00	81.40	104.66	162.80	179.08	195.36	211.64	227.92	244.20	244.20	244.20	244.20	81.40	81.40	81.40	81.40
1/3ARMCAV	0.00	234.22	234.22	0.00	234.22	301.14	468.44	515.28	562.13	608.97	655.82	702.66	702.66	702.66	702.66	234.22	234.22	234.22	234.22
2BDE24MX	0.00	0.97	0.97	0.00	0.97	1.25	1.94	2.13	2.33	2.52	2.72	2.91	2.91	2.91	2.91	0.97	0.97	0.97	0.97
1/64ARBN	0.00	250.00	250.00	0.00	250.00	321.43	500.00	550.00	600.00	650.00	700.00	750.00	750.00	750.00	750.00	250.00	250.00	250.00	250.00
3/15INBN	0.00	165.06	165.06	0.00	165.06	212.22	330.12	363.13	396.14	429.16	462.17	495.18	495.18	495.18	495.18	165.06	165.06	165.06	165.06
4/64ARBN	0.00	250.00	250.00	0.00	250.00	321.43	500.00	550.00	600.00	650.00	700.00	750.00	750.00	750.00	750.00	250.00	250.00	250.00	250.00
VIICORPS	1.00	18.00	18.00	0.00	0.00	18.00	24.00	30.00	36.00	42.00	48.00	54.00	54.00	54.00	54.00	18.00	18.00	18.00	18.00
7COSCOM	4.00	7.00	7.00	0.00	0.00	0.00	0.00	0.00	7.00	11.67	16.33	21.00	21.00	21.00	21.00	7.00	7.00	7.00	7.00
VIIFA	1.00	0.97	0.97	0.00	0.00	0.97	1.29	1.62	1.94	2.26	2.59	2.91	2.91	2.91	2.91	0.97	0.97	0.97	0.97
9FABDEVII	2.00	0.97	0.97	0.00	0.00	0.00	0.97	1.36	1.75	2.13	2.52	2.91	2.91	2.91	2.91	0.97	0.97	0.97	0.97
1/9FABN	2.00	282.12	282.12	0.00	0.00	0.00	282.12	394.97	507.82	620.66	733.51	846.36	846.36	846.36	846.36	282.12	282.12	282.12	282.12
2/9FABN	3.00	282.12	282.12	0.00	0.00	0.00	0.00	282.12	423.18	564.24	705.30	846.36	846.36	846.36	846.36	282.12	282.12	282.12	282.12
3/9FABN	4.00	26.58	26.58	0.00	0.00	0.00	0.00	0.00	26.58	44.30	62.02	79.74	79.74	79.74	79.74	26.58	26.58	26.58	26.58
1ARMDIV	1.00	33.56	33.56	0.00	0.00	33.56	44.75	55.93	67.12	78.31	89.49	100.68	100.68	100.68	100.68	33.56	33.56	33.56	33.56
1DISCOMR	3.00	7.00	7.00	0.00	0.00	0.00	0.00	7.00	10.50	14.00	17.50	21.00	21.00	21.00	21.00	7.00	7.00	7.00	7.00
1DISCOMF	1.00	7.00	7.00	0.00	0.00	7.00	9.33	11.67	14.00	16.33	18.67	21.00	21.00	21.00	21.00	7.00	7.00	7.00	7.00
1ARBDE1AR	1.00	0.97	0.97	0.00	0.00	0.97	1.29	1.62	1.94	2.26	2.59	2.91	2.91	2.91	2.91	0.97	0.97	0.97	0.97
1/5INBN	1.00	63.03	63.03	0.00	0.00	63.03	84.04	105.05	126.06	147.07	168.08	189.09	189.09	189.09	189.09	63.03	63.03	63.03	63.03
2/12ARRGT	2.00	255.63	255.63	0.00	0.00	0.00	255.63	357.88	460.13	562.39	664.64	766.89	766.89	766.89	766.89	255.63	255.63	255.63	255.63
1/8ARBN	2.00	250.00	250.00	0.00	0.00	0.00	250.00	350.00	450.00	550.00	650.00	750.00	750.00	750.00	750.00	250.00	250.00	250.00	250.00
2ARBDE1AR	2.00	0.97	0.97	0.00	0.00	0.00	0.97	1.36	1.75	2.13	2.52	2.91	2.91	2.91	2.91	0.97	0.97	0.97	0.97
1/12ARRGT	2.00	250.00	250.00	0.00	0.00	0.00	250.00	350.00	450.00	550.00	650.00	750.00	750.00	750.00	750.00	250.00	250.00	250.00	250.00
2/5ARBN	2.00	250.00	250.00	0.00	0.00	0.00	250.00	350.00	450.00	550.00	650.00	750.00	750.00	750.00	750.00	250.00	250.00	250.00	250.00
2/8ARBN	2.00	250.00	250.00	0.00	0.00	0.00	250.00	350.00	450.00	550.00	650.00	750.00	750.00	750.00	750.00	250.00	250.00	250.00	250.00
3ARBDE1AR	3.00	0.97	0.97	0.00	0.00	0.00	0.00	0.97	1.46	1.94	2.43	2.91	2.91	2.91	2.91	0.97	0.97	0.97	0.97
6/6INBNMX	3.00	165.06	165.06	0.00	0.00	0.00	0.00	165.06	247.59	330.12	412.65	495.18	495.18	495.18	495.18	165.06	165.06	165.06	165.06
7/6INBNMX	3.00	165.06	165.06	0.00	0.00	0.00	0.00	165.06	247.59	330.12	412.65	495.18	495.18	495.18	495.18	165.06	165.06	165.06	165.06
2INDIV.UK	3.00	7.66	7.66	0.00	0.00	0.00	0.00	7.66	11.49	15.32	19.15	22.98	22.98	22.98	22.98	7.66	7.66	7.66	7.66
2DSBN	4.00	7.00	7.00	0.00	0.00	0.00	0.00	0.00	7.00	11.67	16.33	21.00	21.00	21.00	21.00	7.00	7.00	7.00	7.00
1INRGT	3.00	87.78	87.78	0.00	0.00	0.00	0.00	87.78	131.67	175.56	219.45	263.34	263.34	263.34	263.34	87.78	87.78	87.78	87.78
2FARGT	4.00	2555.40	2555.40	0.00	0.00	0.00	0.00	0.00	2555.40	4259.00	5962.60	7666.20	7666.20	7666.20	7666.20	2555.40	2555.40	2555.40	2555.40
2INRGT	4.00	87.78	87.78	0.00	0.00	0.00	0.00	0.00	87.78	146.30	204.82	263.34	263.34	263.34	263.34	87.78	87.78	87.78	87.78
2TKBN	4.00	250.00	250.00	0.00	0.00	0.00	0.00	0.00	250.00	416.67	583.33	750.00	750.00	750.00	750.00	250.00	250.00	250.00	250.00
3INRGT	4.00	87.78	87.78	0.00	0.00	0.00	0.00	0.00	87.78	146.30	204.82	263.34	263.34	263.34	263.34	87.78	87.78	87.78	87.78
1ARDIV.UK	5.00	33.56	33.56	0.00	0.00	0.00	0.00	0.00	0.00	33.56	67.12	100.68	100.68	100.68	100.68	33.56	33.56	33.56	33.56
1DSBN	5.00	7.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	14.00	21.00	21.00	21.00	21.00	7.00	7.00	7.00	7.00
1ARCAV	5.00	81.40	81.40	0.00	0.00	0.00	0.00	0.00	0.00	81.40	162.80	244.20	244.20	244.20	244.20	81.40	81.40	81.40	81.40
1ARRGT	5.00	255.63	255.63	0.00	0.00	0.00	0.00	0.00	0.00	255.63	511.26	766.89	766.89	766.89	766.89	255.63	255.63	255.63	255.63
1FARGT	5.00	410.38	410.38	0.00	0.00	0.00	0.00	0.00	0.00	410.38	820.76	1231.14	1231.14	1231.14	1231.14	410.38	410.38	410.38	410.38
2ARRGT	5.00	255.63	255.63	0.00	0.00	0.00	0.00	0.00	0.00	255.63	511.26	766.89	766.89	766.89	766.89	255.63	255.63	255.63	255.63
3ARRGT	5.00	255.63	255.63	0.00	0.00	0.00	0.00	0.00	0.00	255.63	511.26	766.89	766.89	766.89	766.89	255.63	255.63	255.63	255.63
IIMEF	2.00	18.00	18.00	0.00	0.00	0.00	18.00	25.20	32.40	39.60	46.80	54.00	54.00	54.00	54.00	18.00	18.00	18.00	18.00
3FSSG.MAR	0.00	99.00	99.00	0.00	99.00	127.29	198.00	217.80	237.60	257.40	277.20	297.00	297.00	297.00	297.00	99.00	99.00	99.00	99.00
3MAR.DIV	0.00	18.00	18.00	0.00	18.00	23.14	36.00	39.60	43.20	46.80	50.40	54.00	54.00	54.00	54.00	18.00	18.00	18.00	18.00
12MAR.HQ	0.00	0.97	0.97	0.00	0.97	1.25	1.94	2.13	2.33	2.52	2.72	2.91	2.91	2.91	2.91	0.97	0.97	0.97	0.97
1/11MAR.E	0.00	100.00	100.00	0.00	100.00	128.57	200.00	220.00	240.00	260.00	280.00	300.00	300.00	300.00	300.00	100.00	100.00	100.00	100.00
1/11MAR.P	0.00	2.00	2.00	0.00	2.00	2.57	4.00	4.40	4.80	5.20	5.60	6.00	6.00	6.00	6.00	2.00	2.00	2.00	2.00
2/12.MAR	0.00	282.12	282.12	0.00	282.12	362.73	564.24	620.66	677.09	733.51	789.94	846.36	846.36	846.36	846.36	282.12	282.12	282.12	282.12
1LAR.BN.E	0.00	25.15	25.15	0.00	25.15	32.34	50.30	55.33	60.36	65.39	70.42	75.45	75.45	75.45	75.45	25.15	25.15	25.15	25.15
1LAR.BN.P	0.00	2.00	2.00	0.00	2.00	2.57	4.00	4.40	4.80	5.20	5.60	6.00	6.00	6.00	6.00	2.00	2.00	2.00	2.00
4MAR.RGT	0.00	0.97	0.97	0.00	0.97	1.25	1.94	2.13	2.33	2.52	2.72	2.91	2.91	2.91	2.91	0.97	0.97	0.97	0.97
2/2.MAR	0.00	87.78	87.78	0.00	87.78	112.86	175.56	193.12	210.67	228.23	245.78	263.34	263.34	263.34	263.34	87.78	87.78	87.78	87.78
2/9.MAR.E	0.00	100.00	100.00	0.00	100.00	128.57	200.00	220.00	240.00	260.00	280.00	300.00	300.00	300.00	300.00	100.00	100.00	100.00	100.00
2/9.MAR.P	0.00	2.00	2.00	0.00	2.00	2.57	4.00	4.40	4.80	5.20	5.60	6.00	6.00	6.00	6.00	2.00	2.00	2.00	2.00

APPENDIX D. ASCII INPUT FILE (CL V)

An example ASCII input file for Class V ammunition is given in this appendix. The eight columns of numbers after the first (unit name) list the respective units' requirements (tons) for each simulated day of combat. The file was developed from the revised plan spreadsheet, and used to input orders into the Joint Theater Level Simulation (JTLS).

CENTCOM	5.1	5.61	6.12	6.63	7.14	7.65	7.65	7.65
THIRDARMY	15.32	16.85	18.38	19.92	21.45	22.98	22.98	22.98
3ARMY.ASG	198	217.8	237.6	257.4	277.2	297	297	297
XVIIIABC	15.2	16.72	18.24	19.76	21.28	22.8	22.8	22.8
18COSCOMF	14	15.4	16.8	18.2	19.6	21	21	21
1/11FABN	564.24	620.66	677.09	733.51	789.94	846.36	846.36	846.36
2/11FABN	564.24	620.66	677.09	733.51	789.94	846.36	846.36	846.36
HQ101ABD	15.2	16.72	18.24	19.76	21.28	22.8	22.8	22.8
101DISCOM	14	15.4	16.8	18.2	19.6	21	21	21
HQ3BDE101	1.94	2.13	2.33	2.52	2.72	2.91	2.91	2.91
1/187IN	163.5	179.85	196.2	212.55	228.9	245.25	245.25	245.25
2/187IN	163.5	179.85	196.2	212.55	228.9	245.25	245.25	245.25
3/187IN	163.5	179.85	196.2	212.55	228.9	245.25	245.25	245.25
HQ1BDE101	1.94	2.13	2.33	2.52	2.72	2.91	2.91	2.91
1/327INBN	163.5	179.85	196.2	212.55	228.9	245.25	245.25	245.25
2/327INBN	163.5	179.85	196.2	212.55	228.9	245.25	245.25	245.25
3/327INBN	163.5	179.85	196.2	212.55	228.9	245.25	245.25	245.25
HQ2BDE101	1.94	2.13	2.33	2.52	2.72	2.91	2.91	2.91
1/502INBN	163.5	179.85	196.2	212.55	228.9	245.25	245.25	245.25
2/502INBN	163.5	179.85	196.2	212.55	228.9	245.25	245.25	245.25
3/502INBN	163.5	179.85	196.2	212.55	228.9	245.25	245.25	245.25
101DIVFA	5110.8	5621.88	6132.96	6644.04	7155.12	7666.2	7666.2	7666.2
3/320FA	564.24	620.66	677.09	733.51	789.94	846.36	846.36	846.36
1/320FABN	564.24	620.66	677.09	733.51	789.94	846.36	846.36	846.36
2/320FABN	564.24	620.66	677.09	733.51	789.94	846.36	846.36	846.36
HQ24MECH	36	39.6	43.2	46.8	50.4	54	54	54
24DISCOMF	14	15.4	16.8	18.2	19.6	21	21	21
1BDE24MX	1.94	2.13	2.33	2.52	2.72	2.91	2.91	2.91
3/69ARBN	500	550	600	650	700	750	750	750
3/7IN24MX	330.12	363.13	396.14	429.16	462.17	495.18	495.18	495.18
22/7INBN	330.12	363.13	396.14	429.16	462.17	495.18	495.18	495.18
24DIVARTY	820.76	902.84	984.91	1066.99	1149.06	1231.14	1231.14	1231.14
3/41FABN	820.76	902.84	984.91	1066.99	1149.06	1231.14	1231.14	1231.14
1/41FABN	820.76	902.84	984.91	1066.99	1149.06	1231.14	1231.14	1231.14
3ARCAVRGT	162.8	179.08	195.36	211.64	227.92	244.2	244.2	244.2
1/3ARMCAV	468.44	515.28	562.13	608.97	655.82	702.66	702.66	702.66
2BDE24MX	1.94	2.13	2.33	2.52	2.72	2.91	2.91	2.91
1/64ARBN	500	550	600	650	700	750	750	750
3/15INBN	330.12	363.13	396.14	429.16	462.17	495.18	495.18	495.18
4/64ARBN	500	550	600	650	700	750	750	750
3FSSG.MAR	198	217.8	237.6	257.4	277.2	297	297	297
3MAR.DIV	36	39.6	43.2	46.8	50.4	54	54	54
12MAR.HQ	1.94	2.13	2.33	2.52	2.72	2.91	2.91	2.91
1/11MAR.E	200	220	240	260	280	300	300	300
1/11MAR.P	4	4.4	4.8	5.2	5.6	6	6	6
2/12.MAR	564.24	620.66	677.09	733.51	789.94	846.36	846.36	846.36
1LAR.BN.E	50.3	55.33	60.36	65.39	70.42	75.45	75.45	75.45
1LAR.BN.P	4	4.4	4.8	5.2	5.6	6	6	6
4MAR.RGT	1.94	2.13	2.33	2.52	2.72	2.91	2.91	2.91
2/2.MAR	175.56	193.12	210.67	228.23	245.78	263.34	263.34	263.34
2/9.MAR.E	200	220	240	260	280	300	300	300
2/9.MAR.P	4	4.4	4.8	5.2	5.6	6	6	6
18COSCOMR	0	11.67	14	16.33	18.67	21	21	21
XVIIIFA	0	4.85	5.82	6.79	7.76	8.73	8.73	8.73
11FABDE18	0	4.85	5.82	6.79	7.76	8.73	8.73	8.73
3/11FABN	0	44.3	53.16	60.75	69.61	79.74	79.74	79.74
24DISCOMR	0	11.67	14	16.33	18.67	21	21	21
VIICORPS	0	30	36	42	48	54	54	54
VIIFA	0	1.62	1.94	2.26	2.59	2.91	2.91	2.91
1ARMDIV	0	55.93	67.12	78.31	89.49	100.68	100.68	100.68
1DISCOMF	0	11.67	14	16.33	18.67	21	21	21
1ARBDE1AR	0	1.62	1.94	2.26	2.59	2.91	2.91	2.91
1/5INBN	0	105.05	126.06	147.07	168.08	189.09	189.09	189.09

9FABDEVII	0	0	1.75	2.13	2.52	2.91	2.91	2.91
1/9FABN	0	0	507.82	620.66	733.51	846.36	846.36	846.36
2/12ARRGT	0	0	460.13	562.39	664.64	766.89	766.89	766.89
1/8ARBN	0	0	450	550	650	750	750	750
2ARBDE1AR	0	0	1.75	2.13	2.52	2.91	2.91	2.91
1/12ARRGT	0	0	450	550	650	750	750	750
2/5ARBN	0	0	450	550	650	750	750	750
2/8ARBN	0	0	450	550	650	750	750	750
IIIMEF	0	0	32.4	39.6	46.8	54	54	54
2/9FABN	0	0	0	564.24	705.3	846.36	846.36	846.36
1DISCOMR	0	0	0	14	17.5	21	21	21
3ARBDE1AR	0	0	0	1.94	2.43	2.91	2.91	2.91
6/6INBNMX	0	0	0	330.12	412.65	495.18	495.18	495.18
7/6INBNMX	0	0	0	330.12	412.65	495.18	495.18	495.18
2INDIV.UK	0	0	0	15.32	19.15	22.98	22.98	22.98
1INRGT	0	0	0	175.56	219.45	263.34	263.34	263.34
7COSCOM	0	0	0	0	16.33	21	21	21
3/9FABN	0	0	0	0	62.02	79.74	79.74	79.74
2DSBN	0	0	0	0	16.33	21	21	21
2FARGT	0	0	0	0	5962.6	7666.2	7666.2	7666.2
2INRGT	0	0	0	0	204.82	263.34	263.34	263.34
2TKBN	0	0	0	0	583.33	750	750	750
3INRGT	0	0	0	0	204.82	263.34	263.34	263.34
1ARDIV.UK	0	0	0	0	0	100.68	100.68	100.68
1DSBN	0	0	0	0	0	21	21	21
1ARCAV	0	0	0	0	0	244.2	244.2	244.2
1ARRGT	0	0	0	0	0	766.89	766.89	766.89
1FARGT	0	0	0	0	0	1231.14	1231.14	1231.14
2ARRGT	0	0	0	0	0	766.89	766.89	766.89
3ARRGT	0	0	0	0	0	766.89	766.89	766.89

APPENDIX E. TIME-CORRELATED ON-HAND MATRIX

A sample portion of a time-correlated on-hand matrix depicting Class V amounts, by unit, at each discrete time reported is shown in this appendix. The time vector in bold numbers across the top represents each unique time at which the amount of Class V changed in at least one of the units listed. For example, at game time .006385, CENTCOM had 5.1 tons (its "bring to theater" amount) of Class V on-hand. This quantity did not change until .583006 when it received a shipment of .60 tons, thereby increasing its on-hand amount to 5.61 tons. Matrices varied in size, the largest being approximately 2200x1000 cells.

Unit	Time	O/H	0.0063847	0.083334	0.125001	...	0.541671	0.5830057
CENTCOM	0.0063847	5.1	5.1	5.1	5.1		5.1	0
CENTCOM	0.5830057	5.61	0	0	0		0	5.61
CENTCOM	1.3330041	6.12	0	0	0		0	0
CENTCOM	2.3330059	6.63	0	0	0		0	0
CENTCOM	3.333007	7.14	0	0	0		0	0
CENTCOM	4.3330067	7.65	0	0	0		0	0
THIRDARMY	0.0063847	15.32	15.32	15.32	15.32		15.32	15.32
THIRDARMY	0.7500059	16.85	0	0	0		0	0
THIRDARMY	1.7500076	18.38	0	0	0		0	0
THIRDARMY	2.7500033	19.92	0	0	0		0	0
THIRDARMY	3.7500085	21.45	0	0	0		0	0
THIRDARMY	4.7500078	22.98	0	0	0		0	0
3ARMY.ASG	0.0063847	275677.9	275677.9	275677.9	275677.9		0	0
3ARMY.ASG	0.4163397	275677.39	0	0	0		0	0
3ARMY.ASG	0.4178058	274683.39	0	0	0		0	0
3ARMY.ASG	0.4187566	274663.59	0	0	0		0	0
3ARMY.ASG	0.5352041	273669.59	0	0	0		273669.59	273669.59
3ARMY.ASG	0.5833399	273668.06	0	0	0		0	0
3ARMY.ASG	0.5844317	273473.19	0	0	0		0	0
3ARMY.ASG	0.5847373	272479.19	0	0	0		0	0
3ARMY.ASG	0.6683565	270399.55	0	0	0		0	0
3ARMY.ASG	0.9177462	270339.8	0	0	0		0	0
3ARMY.ASG	1.0848354	270203.6	0	0	0		0	0
3ARMY.ASG	1.0848608	247034.62	0	0	0		0	0
3ARMY.ASG	1.1663381	247034.11	0	0	0		0	0
3ARMY.ASG	1.1677853	246946.23	0	0	0		0	0
3ARMY.ASG	1.4176681	246873	0	0	0		0	0
3ARMY.ASG	1.5833416	246871.47	0	0	0		0	0
3ARMY.ASG	1.5848982	246351.47	0	0	0		0	0
3ARMY.ASG	1.6673719	246215.04	0	0	0		0	0
3ARMY.ASG	2.1663399	246214.53	0	0	0		0	0
3ARMY.ASG	2.1676011	246194.73	0	0	0		0	0
3ARMY.ASG	2.5833373	246193.19	0	0	0		0	0
3ARMY.ASG	2.6682763	246069	0	0	0		0	0
3ARMY.ASG	3.166341	246068.49	0	0	0		0	0
3ARMY.ASG	3.1678149	246048.69	0	0	0		0	0
3ARMY.ASG	3.5833425	246047.16	0	0	0		0	0
3ARMY.ASG	3.6713309	245922.95	0	0	0		0	0
3ARMY.ASG	4.1663407	245922.44	0	0	0		0	0
3ARMY.ASG	4.1676417	245902.64	0	0	0		0	0
3ARMY.ASG	4.4177533	243773.38	0	0	0		0	0
3ARMY.ASG	4.5833418	243771.85	0	0	0		0	0
3ARMY.ASG	4.6681815	243647.66	0	0	0		0	0
3ARMY.ASG	4.6683116	241288.22	0	0	0		0	0
3ARMY.ASG	4.9183362	240683.45	0	0	0		0	0
3ARMY.ASG	5.6676024	240558.28	0	0	0		0	0
3ARMY.ASG	6.1674487	240505.91	0	0	0		0	0
XVIIIABC	0.0063847	15.2	15.2	15.2	15.2		15.2	15.2
XVIIIFA	1.0034722	4.85	0	0	0		0	0
XVIIIFA	2.3245064	5.82	0	0	0		0	0
XVIIIFA	2.8078467	6.79	0	0	0		0	0
XVIIIFA	3.8078503	7.76	0	0	0		0	0
XVIIIFA	4.8078586	8.73	0	0	0		0	0
18COSCOMF	0.0063847	14	14	14	14		0	0
18COSCOMF	0.3334825	12.48	0	0	0		0	0
18COSCOMF	0.3337143	2.1	0	0	0		2.1	2.1
18COSCOMF	2.1000568	18241	0	0	0		0	0
18COSCOMF	2.1665732	18239.6	0	0	0		0	0
18COSCOMF	2.3335217	18238.08	0	0	0		0	0
18COSCOMF	2.3336033	18181.66	0	0	0		0	0
18COSCOMF	2.3336405	18174.07	0	0	0		0	0

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